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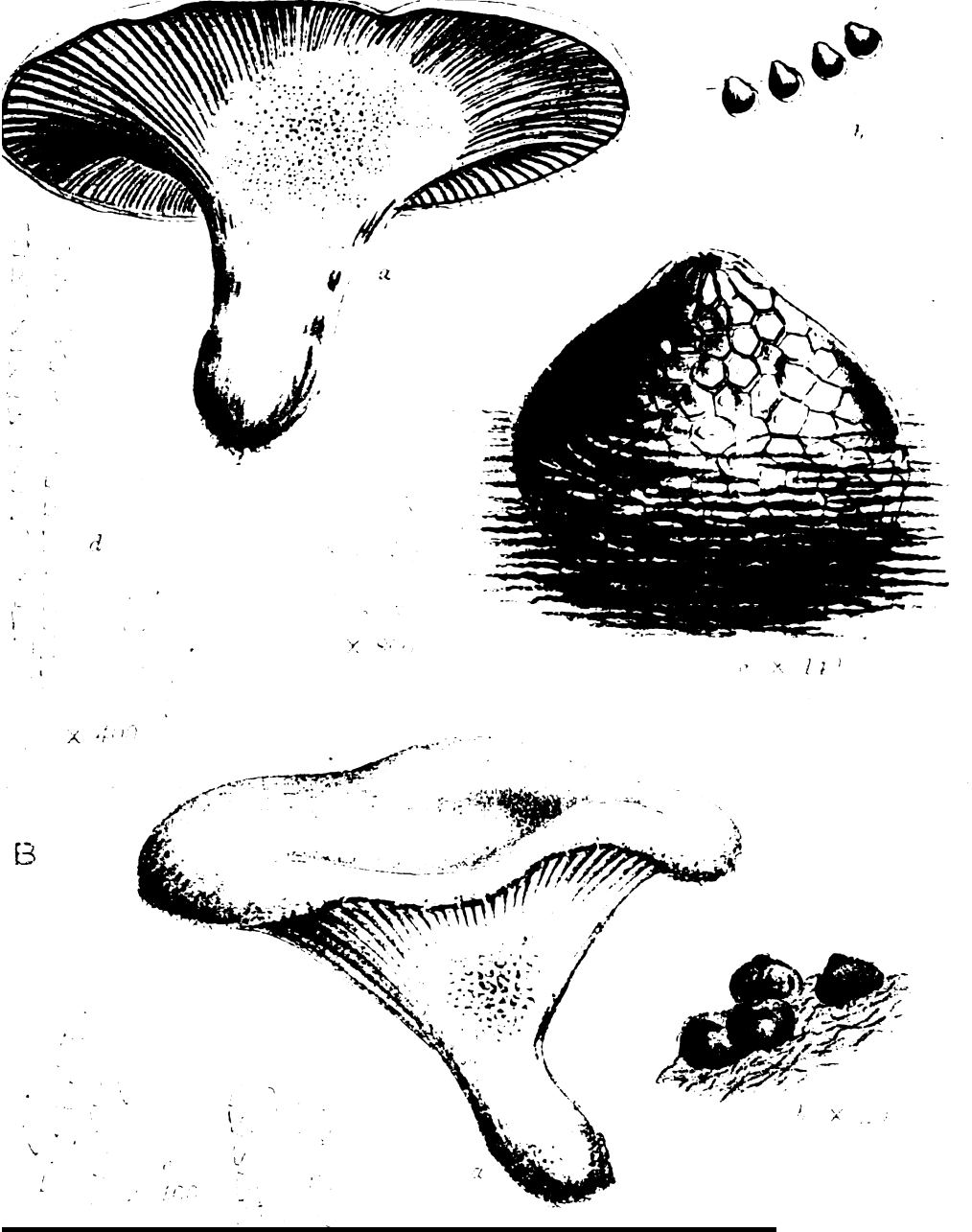

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Woolhope Naturalists' Field Club

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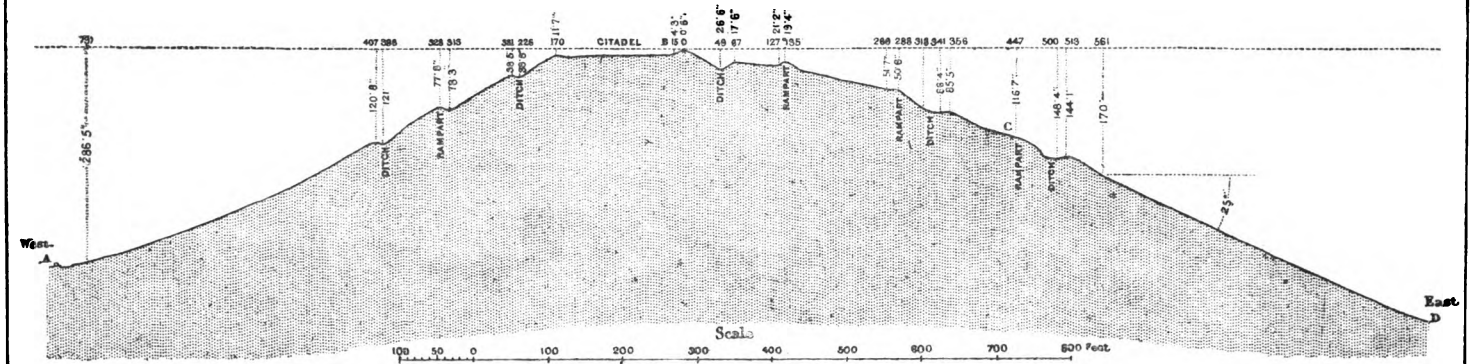

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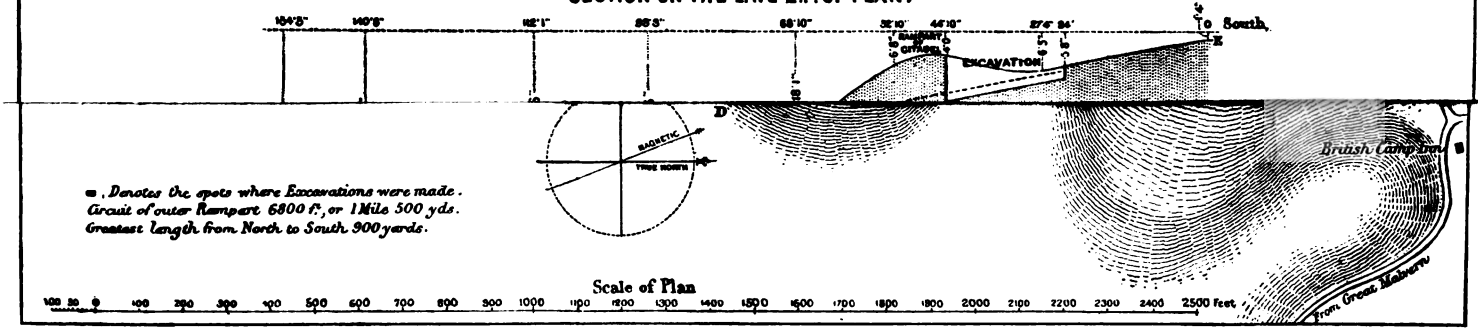

■, Denotes the spots where Excavations were made.
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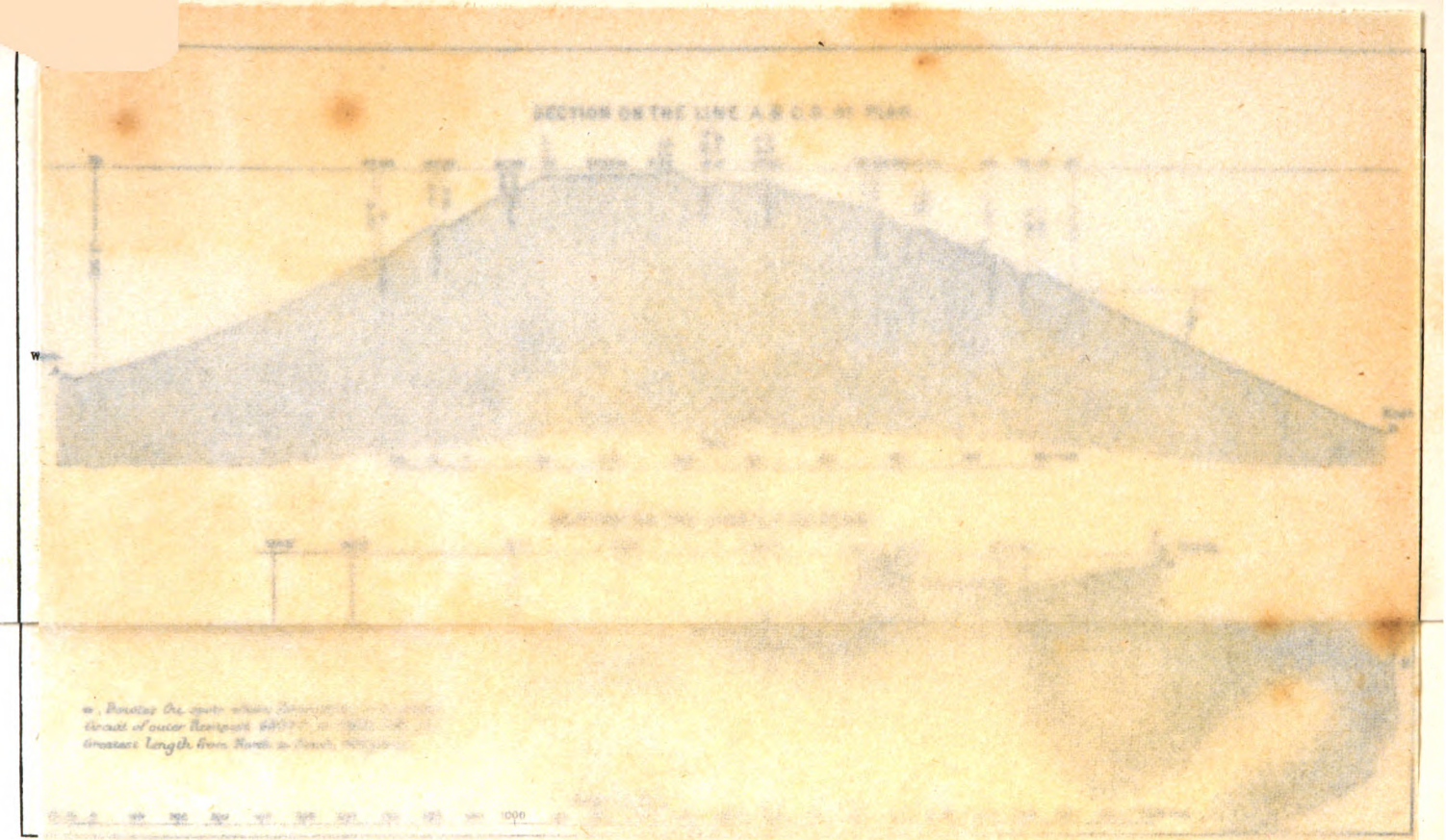

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OF THE

WOOLHOPE

NATURALISTS' FIELD CLUB.

[ESTABLISHED 1851.]

1877—1878—1879—1880.

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WOOLHOPE NATURALISTS' FIELD CLUB.

PRESIDENTS

FROM ITS COMMENCEMENT IN 1851.

1851	Club formed in the Winter months
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1853	Lewis, Rev. T. T.
1854	Symonds, Rev. W. S.
1855	Crouch, Rev. J. F.
1856	Wheatley, Mr. Hewitt
1857	Lingen, Mr. Charles
1858	Brown, Dr. G. P.
1859	Crouch, Rev. J. F.
1860	Banks, Mr. R. W.
1861	Lightbody, Mr. Robert
1862	Hoskyns, Mr. Chandos Wren
1863	Hoskyns, Mr. Chandos Wren
1864	Crouch, Rev. J. F.
1865	Steele, Mr. Elmes Y.
1866	Bull, Dr. H. G., M.D.
1867	Hoskyns, Mr. Chandos Wren
1868	McCullough, Dr.
1869	Rankin, Mr. James
1870	Cooper-Key, Rev. H.
1871	Cam, Mr. Thomas
1872	Steele, Mr. Elmes Y.
1873	Davies, Rev. James
1874	Davies, Rev. James
1875	Robinson, Rev. C. J.
1876	Chapman, Dr. T. A., M.D.
1877	Morris, Mr. J. Griffith
1878	Phillott, Rev. H. W.
1879	Armitage, Mr. Arthur
1880	Knight, Mr. J. H.

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TREASURER—

Mr. Thomas Cam.

AUDITORS—

Mr. James Davies Mr. J. T. Owen Fowler

SECRETARY—

Mr. Arthur Thompson.

1878.

PRESIDENT—

Rev. H. W. Phillott, Staunton-on-Wye.

VICE-PRESIDENTS—

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McCullough, Dr. D. M., Larchfield, Abergavenny.
Merewether, Rev. Francis, Woolhope.
Merriman, Dr. J. Jones, 45, Kensington Square, London.
Metcalfe, Rev. G. M., Pipe and Lyde.
Middleton, Mr. J., Westholme, Cheltenham.
Mogridge, Rev. H. T., Knill.
Morris, Mr. J. Griffith, St. Owen Street.
Moore, Mr. H. C., King Street.
Nicholson, Mr. Thos., St. Peter Street.
Norman, Mr. J., Ross.
Norris, Mr. J. E., J.P., Castle Street.
Owen, Rev. E. J., Tretire.
Palin, Rev. E., Linton.
Paris, Mr. T. C., Hampton Lodge.
Pateshall, Mr. Evan, Allensmore Court.
Peyton, Colonel, Colwall.
Phillips, Mr. W., Bartonsham.
Phillott, Rev. H. W., Staunton-on-Wye.
Piper, Mr. G. H., Court House, Ledbury.
Powell, Rev. T. Prosser, Peterchurch.
Power, Captain, The Hill Court, Ross.
Poole, Rev. W., Hentland.
Prickard, Rev. W. E., Clyro Vicarage, Hay.
Purchas, Mr. Alfred, Broad Street, Ross.
Rankin, Mr. James, M.P., Bryngwyn.
Rees, Captain, The Cedars, Pontrilas.
Reid, Captain Mayne, Frogmore House, Ross.
Ridley, Rev. O. M., Bishopstone.

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Riley, Mr. J., Putley Court, Ledbury.
Robinson, Mr. Stephen, Lynhales, Kington.
Roche, Mr. F., Tregunter, Talgarth.
Rootes, Mr. Charles, St. Owen Street.
Salwey, Mr. Theophilus J., Ludlow.
Scobell, Mr. E. C., Kynastone, Ross.
Severn, Mr. J. P., Penybont Hall, Penybont.
Shackleton, Rev. Thos., Broomy Hill.
Shaw, Mr. A., Bridge Street.
Shellard, Mr. Orlando, Barton Manor House.
Shepherd, Rev. W. R., Broomy Hill.
Smith, Mr. R. Vassar, Ashfield, Great Malvern.
Smith, Rev. T. T., Thruxton.
Southall, Mr. Henry, Ashfield, Ross.
Stanhope, Rev. B. L. S., Byford.
Stanhope, Rev. W. P. S., Holme Lacy.
Steele, Mr. Elmes Y., Frogmore Street, Abergavenny.
Stillingfleet, Rev. H. J. W., Hampton Bishop.
Swinburne, Mr. W. A., Dûlas, Hay.
Symonds, Mr. J. F., Broomy Hill.
Tatham, Rev. F. H., Cathedral School.
Taylor, Dr. W., 21, Crockherbtown, Cardiff.
Tedman, Rev. J., Much Birch, Ross.
Thackwell, Rev. Stephen, Little Birch.
Thomas, Rev. W. Jones, Llanthomas, Hay.
Thomason, Mr. Richard, Drybridge House.
Truscott, Mr. Chas., jun., Trevarrick, St. Austell, Cornwall.
Turner, Mr. Thomas, St. Owen's Street.
Tweed, Rev. H. W., Bridstow.
Vaughan, Rev. F. S. Stoke, Wellington Heath.
Vevers, Mr. Henry, St. Owen's Street.
Waldron, Mr. Clement, Llandaff.
Warner, Rev. J. H., Almeley.
Wegg-Prosser, Mr. F. R., Belmont.
Westropp, Rev. C. J., Wormbridge.
Wheatley, Mr. T. E., West Bank, Ledbury.
Williams, Mr. E. Colt, Gate House.
Wood, Mr. H. H., White House, Vowchurch.
Wood, Mr. J. H., M.B., Tarrington.
Woodhouse, Mr. J. G., Burghill House.
Woollam, Rev. J., Yarkhill.
Woollet., Mr. R. F., The Mount, Newport, Mon.
Wyatt, Rev. W., Hope-under-Dinmore.
Wynn, Mr. N. S., Broad Street.
Young, Rev. A., Alresford, Hants.

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RULES

OF THE

WOOLHOPE NATURALISTS' FIELD CLUB.

I.—That a Society be formed under the name of the "Woolhope Naturalists' Field Club," for the practical study, in all its branches, of the Natural History of Herefordshire and the districts immediately adjacent.

II.—That the Club consist of Ordinary Members, with such Honorary Members as may be admitted from time to time; from whom a President, four Vice-Presidents, a Central Committee, Treasurer, and Honorary Secretary be appointed at the Annual Meeting to be held at Hereford in the early part of each year. The President and Vice-Presidents to change annually.

III.—The Central Committee shall consist of three Members, resident in the city or in its immediate vicinity, with the President, Vice-Presidents, and Honorary Secretary, *ex-officio*. It shall be empowered to appoint an Assistant Secretary; and its duties shall be to make all the necessary arrangements for the meetings of the year, and take the management of the Club during the intervals of the meetings.

IV.—That the Members of the Club shall hold not less than three Field Meetings during the year, in the most interesting localities for investigating the Natural History of the district. That the days and places of such regular meetings be selected at the Annual Meeting, and that ten clear days' notice of each be communicated to the Members by a circular from the Secretary; but that the Central Committee be empowered, upon urgent occasions, to alter the days of such regular Field Meetings, and also to fix special or extra Field Meetings during the year.

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V.—That an Entrance Fee of Ten Shillings shall be paid by all Members on election, and that the Annual Subscription be Ten Shillings, payable on the 1st of January in each year to the Treasurer, or Assistant Secretary. Each Member may have the privilege of introducing a friend on any of the field days of the Club.

VI.—That the Reports of the several meetings and the papers read to the Club during the year, be forwarded, at the discretion of the Central Committee, to the *Hereford Times* newspaper for publication as ordinary news, in preparation for the Transactions of the Club.

VII.—That the cost of any lithographic or other illustrations be defrayed by the author of the paper for which they may be required, unless the subject has been taken up at the request of the Club, and in that case, the cost of such illustration to be paid for from the Club funds, must be specially sanctioned at one of the general meetings.

VIII.—That the President for the year arrange for an address to be given in the field at each meeting, and for papers to be read after dinner; and that he be requested to favour the Club with an address at the Annual Meeting, on the proceedings of the year, together with such observations as he may deem conducive to the welfare of the Club and the promotion of its objects.

IX.—That all candidates for Membership shall be proposed and seconded by existing Members, either verbally or in writing, at any meeting of the Club, and shall be eligible to be ballotted for at the next meeting, provided there be FIVE Members present; one black ball in THREE to exclude.

X.—That Members finding rare or interesting specimens, or observing any remarkable phenomenon relating to any branch of Natural History, shall immediately forward a statement thereof to the Hon. Secretary, or to any member of the Central Committee.

XI.—That the Club undertake the formation and publication of correct lists of the various natural productions of the County of Hereford, with such observations as their respective authors may deem necessary.

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XII.—That members whose subscriptions shall remain for *three* years in arrear after demand, be held to have withdrawn, and their names shall accordingly be omitted from the list of members at the ensuing Annual Meeting.

XIII.—That the Assistant Secretary do send out circulars ten days at least before the annual Meeting, to all members who have not paid their subscription, and drawing their particular attention to Rule XII.

XIV.—That these Rules be printed annually with the Transactions, for general distribution to the members.

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Woolhope Naturalists' Field Club.

THE first field-meeting of the Woolhope Club, which should have taken place on May 17th, was altogether prevented by the rain, which began early in the morning and continued, more or less, throughout the day. Only a few of the members mustered, and they speedily decided to stop at home, and reserve themselves for the next occasion. They intended to have gone to Mordiford, where the Rev. F. Merewether had agreed to meet them and point out some beds of *débris* that had been drifted out of the Woolhope Valley. Mr. Merewether, with commendable punctuality, did not allow himself to shirk the appointment, and, in spite of the mud and rain, kept his tryst, and, with his bag and hammer, was ready to guide the Club into new paths, and direct their attention to those facts which his residence in the locality had enabled him to observe. Although the morning was unfavourable to the field pursuits of the Club, yet many assembled in the evening to listen to Dr. Bull's paper on "Mr. Knight and his work in the Apple Orchards."

On Tuesday, June 19th, thirty members and some visitors—for the most part members of the Caradoc and Cotteswold Clubs—assembled at the railway station (Barr's Court), and thence, travelling through blooming orchards, new-mown grass, and occasional hop grounds, arrived, after a short and pleasurable drive, at the Ledbury Station, blocked up (as it happened to be market day) with butter and poultry borne in big baskets by bustling dames and damsels. At the station carriages were in readiness to take the party into Ledbury, through, and out again along the Tewkesbury road, skirting Eastnor Park and Castle, to a notch in the Malvern range, between the Midsummer and Ragged stone hills, called the Holly-bush Pass, which may have sometime deserved the name, but does not now. Here the members alighted, and had scarcely shaken the dust off their coats, when the Rev. W. S. Symonds, of Pendock, was seen coming up the opposite side of the pass, accompanied by Sir Wm. Guise and the Rev. J. D. La Touche, Presidents of their respective Clubs.

And now, after interchanging greetings and giving the final touch to the arrangements, the walk of the day began.

It is easy to get to the top of the Midsummer hill by a winding path through the fern, in half-an-hour, and when there it is delightful to meet the cool breeze, and feast one's eyes on the far distant and almost complete panorama; but as time was getting on, the members arranged themselves on a bank, sloping eastward, and overlooking the Eastnor Obelisk, while Mr. Symonds, standing above them

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on the ridge, commenced his address by pointing out, with his hammer reversed, and naming the principal hills and landmarks. He rapidly gave the geological history of the district, especially alluding to the denudation period. He mentioned some curious local traditions connected with Ragged stone hill, and concluded by giving an account of the formation of the "Red Earl's Dyke," which runs along the greater length of the Malvern Ridge. Then leading the way down by a steep and crumbling path to a quarry situated at the north of the pass, whose bare sides well displayed their geological structure, he escorted the Club to a field where, under shady elms, was spread an abundance of substantial fare well adapted to the occasion. After luncheon, Mr. Symonds made a few additional remarks, and said that it always afforded him pleasure to spend a day with the Woolhope Club.

Sir Wm. Guise took the opportunity of alluding to a very interesting expedition he had made to Auvergne, and advised those present having leisure to do the same.

The Rev. J. D. La Touche observed that he was making some calculations concerning the thickness of aqueous deposits in reference to the formation of strata in by-gone periods, and invited anyone interested to co-operate with him.

Re-invigorated and very thankful to their "guide, philosopher, and friend," for his hospitality and forethought, the Club proceeded to the Obelisk, noticing the damaging effects of wind and weather on the south face and angles, and then sauntering homewards in twos and threes through Eastnor Park, every now and then startling its four-footed occupants from their repose under the trees, the naturalists were not sorry to find the return carriages awaiting them at the Eastnor Arms Inn.

Dinner over, the President called the attention of those present to a suggestion made that morning on the hill, by Mr. Symonds, "That a portrait of the late Rev. T. T. Lewis, of Aymestrey, one of the first Presidents of this Club, be placed in the Club-room, with an inscription setting forth that to him were really due the honour and credit of arranging the succession of rocks now known as the Silurian system; and for this purpose he would lend a photograph for enlargement."

The suggestion seemed generally approved of, and would have been officially submitted to the Club for their sanction, but that proceeding became no longer necessary, for an enthusiastic member, charmed with the idea, had undertaken at his own cost, at once to carry out the proposal, on condition that his name should not be mentioned.

Mr. Blashill was then called on to read a paper he had prepared on "The Spanish Chestnut as a substitute for Oak." This paper was illustrated by a great variety of sections, showing the difference of arrangement of medullary rays in the timber of each tree.

Dr. Chapman sent for the inspection of the Club some specimens of larvæ and perfect insects, male and female, of *Emphytus Serotinus*, a species of sawfly

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that has been for the last two seasons very destructive to the young leaves of the oak. He had noticed trees 30 or 40 feet high much denuded. It belongs to the same class as the gooseberry fly, and the eggs are laid on the buds or young branches. They hatch in the spring. The larvæ at once begin to feed on the young leaves, when full grown fall to the ground, and, hiding in the grass, after a short time emerge as flies, that may be seen at the end of summer in swarms under the trees. The larvæ, coiled up, readily fall off the branches, and may be observed climbing up the trunk of the tree again, if they are so fortunate as to find it, and there is no doubt that multitudes are thus destroyed, especially on a windy day, if accompanied by rain.

The President brought with him some specimens of a mildew that is at this time attacking the apple trees. It is found on the young leaves, and, from its white mealy appearance, is readily observed. The infected leaf withers, turns brown, hardens, and falls off, all the leaves on the same spray following. Under the microscope the peculiar whiteness is seen to be caused by an infinite number of oval cells, nearly transparent, quite or partially detached from each other, lying loose on both surfaces of the leaf. These are the characters of an Oidium, a very destructive form of fungus belonging to the family of "Moulds." Among its relatives are the Oidium Tuckeri, which has been so injurious to the vine, and the Peronospora to the potato. This fungus has appeared in several parts of the kingdom. On the medlar, it had already come under the notice of Dr. Cooke, an expert whom the Club claims as one of its honorary members. He pronounced it to be Oidium Farinosum.

Mr. Riley, of Putley, exhibited some fine specimens of "Platanthera Chlorantha" (the butterfly orchis), and "Neottia Nidus avis" (the bird's nest orchis).

The members present were—Mr. J. G. Morris (president), Mr. T. Curley, C.E., Mr. T. Blashill, Rev. W. S. Symonds, Mr. W. Phillips, Rev. T. M. Beavan, Rev. W. C. Fowle, Rev. F. T. Havergal, Mr. R. Rees, Mr. J. R. Symonds, Mr. A. Thompson, Rev. C. J. Westropp, Rev. F. S. Stooke-Vaughan, Rev. S. Thackwell, Rev. John Tedman, Rev. J. E. Jones Machen, Mr. Jas. Lloyd, Rev. G. H. Clay, Mr. W. A. Swinburne, Rev. J. E. Grasett, Mr. J. T. O. Fowler, Mr. H. C. Moore, Mr. J. Davies, Rev. H. W. Tweed, Mr. J. E. Norris, Mr. Riley.

The visitors were—Sir W. V. Guise, Mr. Stone, Rev. J. D. La Touche, Rev. Henry Day, Rev. Holland Sandford, Mr. H. Heap, Count Stenbok, Mr. N. A. Ball, &c.

The Rev. F. H. Tatham and Rev. John Tedman were elected members, and the Rev. A. Ley (Sellack), and the Rev. W. D. V. Duncombe were proposed for future election.

The next meeting of the Club will be at Tintern Abbey, on Tuesday, July 17th (the Ladies' Day).

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Woolhope Naturalists' Field Club.

THE following paper on "Monastic Buildings" was read at Tintern by Mr. THOMAS BLASHILL, on the occasion of the visit of the above Club to Tintern Abbey, August 21st.

Tintern Abbey was a house of that branch of the Benedictine Order known as Cistercians or White Monks. It was founded in 1131 by Walter de Clare, who, becoming possessed of a vast extent of country, including Monmouthshire, did like all the great nobles of his time, in settling a small part of his possessions to religious uses. The Cistercian Order had only been established in 1098, and confirmed by Pope Pascal in 1100. St. Bernard, to whom it owed its great celebrity, joined it in 1112; its first house in England was founded at Waverley in 1128; Tintern was therefore one of the first evidences of the power to which the Order so suddenly attained. Of the monastic buildings then erected nothing remains. Whether or not these monks suffered the vicissitudes common to the earlier houses of their Order, we may be sure that rigid plainness characterize their buildings, as voluntary austerity marked their life.

The existing building owes its foundation to Roger Bigod, Earl of Norfolk, a descendant of this branch of the family of de Clare and owner of their lands, who, in 1269, caused this work to be begun. The church was finished in 1288, and it stood in its glory for two centuries and a half, till the dissolution of the monastery in 1537. It thus became one of the later examples of the Cistercian buildings; for long before the dissolution monasteries had ceased to be newly constructed, although in 1496, only 41 years before that catastrophe, the monks were partially rebuilding their cloister and the quarters of the Prior. They were thus but indifferent prophets of the future, and this last work, shows by its magnificence that they were then but indifferently austere.

But these buildings of 1269 were undertaken in what most persons will think the happiest moment of the history of English architecture. It was the very year in which the new choir and transepts of Westminster Abbey, built by Henry III., were opened. It was just at the time when the graceful simplicity of the Ladye Chapel of Hereford Cathedral had developed into the richer style—especially as regards the windows—of the great north transept. The beauty of the mouldings, the elegance of the outlines of the 13th century, are preserved; the purity of its carving not quite lost; the glories of the 14th century tracery are anticipated; while there is a reserve of fancy, a grand uniformity which hardly any other building of its age can rival. As to its character as a ruin (pity

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that it should be a ruin), I can point out nothing which every lover of the picturesque will not see for himself. In that quality it is clearly unequalled amongst our monastic remains; and whenever people talk of scenes which have afforded them the fulness of delight, this romantic valley, these graceful outlines and sweet tints of stone and foliage, yon broken eastern window—across whose solitary mullion the rising moon will, three nights hence, shine round and broad—are first and last remembered.

Having been requested to describe this Abbey, I have thought that it would be most useful to give such an outline of the origin and usage of Monastic buildings as may enable persons who read of monks, canons, and friars, and who visit their houses, to form some clear notions of what they were and how they lived. I shall therefore give a short account of Monastic buildings in general, and point out in what respects those of the various religious orders differed from each other, and Tintern from those of its own kind.

In the early ages of Christianity, the habit (common to different forms of worship) of retiring from the world for purposes of prayer and self-discipline was established in the Church. When the system of solitary retirement had become open to scandal, through its abuse by vicious persons, communities were formed whose members bound themselves to strict discipline as a means towards leading a religious life. St. Benedict, who lived in the sixth century, is credited with having first drawn up the rules which were, at a later period, firmly established as the regulations of the great Order of Benedictine Monks.

During the darkest period of the Middle Ages the monasteries increased in number, and, although they suffered much from the troubles of the times, the monks persevered in the cultivation of learning and all the arts and crafts. There still exists at St. Gall, in Switzerland, the plan of a monastry, drawn early in the ninth century, which shows the church of the monks surrounded by a vast number of buildings devoted to all the purposes of convenient existence. In addition to living and sleeping rooms, there are libraries, schools, guest-houses for rich and poor, store-houses, infirmaries, a surgery, workshops for all manner of trades, servants' quarters, herb gardens, and a cemetery. Indeed it is like the plan of a small town, with the church and the offices of the governing body placed in the centre of the whole. In the more peaceful times of the 11th and 12th centuries, when the Benedictine Order had spread over civilised Europe, the best plan for a monastery was found to be simpler in arrangement than that just mentioned, and was never greatly departed from by any of the religious orders.

The monastery as then arranged included these essential parts. There was first the Church, the other monastic buildings being grouped on one side of it, instead of surrounding it as in the earlier plan. The four covered walks of the cloister enclosed an open space which was the cloister-garth, the whole being attached to one side of the nave. The buildings on the eastern side of the cloister and adjoining the church, were such as the sacristy and chapter-house devoted to the service of the church and to discipline, those on the side of the cloisters

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opposite to the church were residential—being living and sleeping-rooms, dining-rooms, and kitchen; while the remaining side—that to the west—was given up to the lay brothers of the house, and in some cases also to guests. All these buildings were generally on the south or sunny side of the Church, but quietness and good drainage were reckoned of prime importance. Accordingly they are found on that side of the church which is farthest from the town and nearest to a good stream of water—a branch of the river being often made to flow through the great sewer of the house. Thus the monastic buildings are sometimes found on the north side of the church, their plan being simply reversed, and of this Canterbury, Gloucester, and Tintern are well-known examples.

The older Benedictine monasteries, which had reached their extreme development in the 12th century, were chiefly built in the suburbs of towns, or in places so convenient for business that towns soon grew up by their side. Outside the cloister gate, to the west, these monks added vast ranges of buildings—barns, stables, separate guest-houses, and almshouses for distributing the daily dole of food to wandering poor. The infirmary was usually placed to the east, and outside the cloister pale. The abbots, who originally had their apartments close to the living and sleeping rooms of the monks, built in later times grand lodges to the west of the monastic buildings, where they could live in state and receive visitors of distinction, as well as supervise the increasing out-door business of the house, while the daily supervision of the monks was left to the prior and sub-prior. The importance of these houses became enormous; many of their abbots were, as such, peers of Parliament. The Abbeys of Westminster, Gloucester, Tewkesbury, Malvern, Evesham, and Pershore, are well-known examples of the older Benedictine monasteries. The Priory of Leominster was a cell of the Benedictine Abbey of Reading.

Meanwhile the religious concerns of the monks were liable to be neglected, and discipline was often relaxed; reformation was needed, and in due course it came. About the end of the 11th century a small band of monks—one of whom was Stephen Harding, an Englishman—retired into a wild and desolate forest in Burgundy, and founded the Abbey of Citeaux, from which Tintern and Abbey Dore, Fountains, Kirkstall, Netley, Buildwas, Melrose, and the long list of Cistercian houses took their rise. An earlier reformation had been attempted at Cluny in Burgundy in 912, but the subsequent reformation of the Cistercians was far more thorough and successful. Disgusted with the laxity of the older Benedictines, they drew up new rules more in the spirit of St. Benedict, and an examination of them will show that the words—poverty, celibacy, and obedience, convey but a faint notion of the discipline to which a Cistercian monk had to conform, even in the minutest details of every-day life.

Their abbeys were always built in retired places, usually the narrow part of some valley, a description which the site of Tintern precisely fits. The monks were thus secluded from the great world, freed from constant visitors and mendicants, and at liberty to devote themselves to their religious duties and the super-

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vision of their lay-brothers, who as a rule did all the work of the farms. It was not even necessary for them to devote their time greatly to literature; and in order to escape the reproach which in time grew out of this, they made endowments to the universities. Though the monk was vowed to poverty the monastery grew rich. The valley which they found savage and deserted they made safe and fruitful, and left in the condition which is now our highest idea of the picturesque.

The older Benedictines wore a black habit. The habit of the Cistercian was white, consisting of a narrow tunic and a long robe with sleeves with a cord round the waist, and shoes and stockings. He must not wear a cowl, nor a shirt, gloves, or boots. He could not leave the cloister except on some special occasion; he worked only occasionally, for discipline or in time of harvest; but he must mend his own clothes, clean his shoes, and take his turn in supervising the kitchen. From Easter to September he had only one meal per day. He had no meat, and seldom even fish. If he departed in the smallest degree from strict rule, if he even forgot to tie his shoe, he had to confess and endure penance. As a rule, he had to keep silence, the times when he might speak—and the places—were strictly limited. His times of washing, and shaving, and bleeding, were settled for him. He was neglectful of his person, even to the extent of harbouring vermin, not, we may be sure, from the love of dirt, but for the mortification of the flesh, and it is very possible that this form of austerity, like others, was not rigorously enforced at all times and in all monasteries. This general severity of rule extended to the monastic buildings. There must be no high tower, but only a wooden bell cot, and but one bell. No rich carving, no representation of the human figure, no picture except that of our Saviour was allowed, nor any stained glass, no gold or silver plate. There was no separate projecting Ladye Chapel, such as existed in most large churches, for every one of the 1,200 churches of the Cistercian Order was dedicated to the Blessed Virgin, and was thus itself a Ladye Chapel. Some of the strictest rules were relaxed in practice in later times in spite of the reproofs of the official visitors, but still the great characteristics by which a Cistercian abbey may now be known are the fewness of its parts and the simplicity and grace of its outline.

THE CHURCH.

The earlier churches of the Cistercians had frequently a low lean-to building attached to the western end, forming a sort of porch or narthex, and in the description of Tintern, sold in the abbey, such a building is shown. There is, however, no reason whatever to think that it ever existed in the present church. It is important that we see things not as we may think they ought to be, but as they are. The church is, according to rule, cruciform, the original chancel would only have two bays, but this has four, and is exceedingly stately and handsome. The whole of the piers in the eastern part had detached shafts in their hollows, and these shafts would probably be of Purbeck marble. They have, however, been torn out, and wherever they were taken might possibly be traced even now. In conventual churches some provision was usually made for the attendance of

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the lay brethren and for ordinary workmen, villagers, and travellers. This was sometimes in the west end of the nave, or in one or both aisles, but in the larger communities a separate church was often built, or even two, as at Evesham. The arrangement here is very interesting, the aisles being divided by solid stone screens from the nave, chancel, and transepts. I think the lay brothers had the western part of the nave, and the guests and parishioners the whole of the south aisles and transept. The place of the high altar is distinctly marked, a crypt, probably for burial, has been constructed under it at a later date. Like other Cistercian churches, this had two altars in each transept, there were also altars at the east end of each chancel aisle; in the south aisle the sedilia and piscina still exist in a mutilated condition. In the north chancel aisle is a doorway, probably used by the monks in the infirmary for occasional access without passing through the cloister. In the north-west corner of the north transept may be seen remains of the staircase by which the monks descended from their dormitory to all the night services, which took place every four hours. They sat in the choir—not in what we commonly call the chancel (which was really the presbytery) but in the space under the tower, and some part of the nave. A screen would probably divide this part from the western part of the nave, and one is shown in the plan sold in the abbey, but there is now no evidence of its existence.

THE MONASTIC BUILDINGS.

In the range of buildings that extends from the north transept there is first a pair of narrow rooms which adjoin the transept—the eastern room, which is vaulted, and is entered from the church was the Sacristy; but the western one, which opens direct from the cloister, is of very uncertain use. In one form or another, it exists in nearly every monastery. It is sometimes called the parlour, or the place where, in cloister time, any monk who had business with the abbot, or a brother, had to speak—for silence was enjoined in the cloister itself. It has been thought to be the place where the body of a deceased monk lay before the time of burial; but we have a very minute account of every detail of that which was done from the death to the burial of a Cistercian monk, and this seems not to have been possible in their case. The only written record of this place that I have heard of would show it to be the place where the parchment, wax, and other articles used by the writers of manuscripts were bought of travelling merchants—but I own that this seems most unlikely, for it is in the very heart of the monastery, where strangers would be excluded. My friend, Mr. Edmund Sharpe, lately deceased (whose authority stood highest in these questions), thought this place was the penitentiary, or place where a monk had to do penance in sight of his brethren, or even to be confined for any of the offences—great or small—which they seem to have been always committing. Sometimes this cell has a door, sometimes not. At Llanthony it has a very handsome open archway, and is lighted by a window in the east end. In such a place penance might be done in public view, and yet without interfering with the ordinary use of the cloister.

The next building is the Chapter House, the doorway and windows of which were always open to the cloister. In fact, here there are three open arch-

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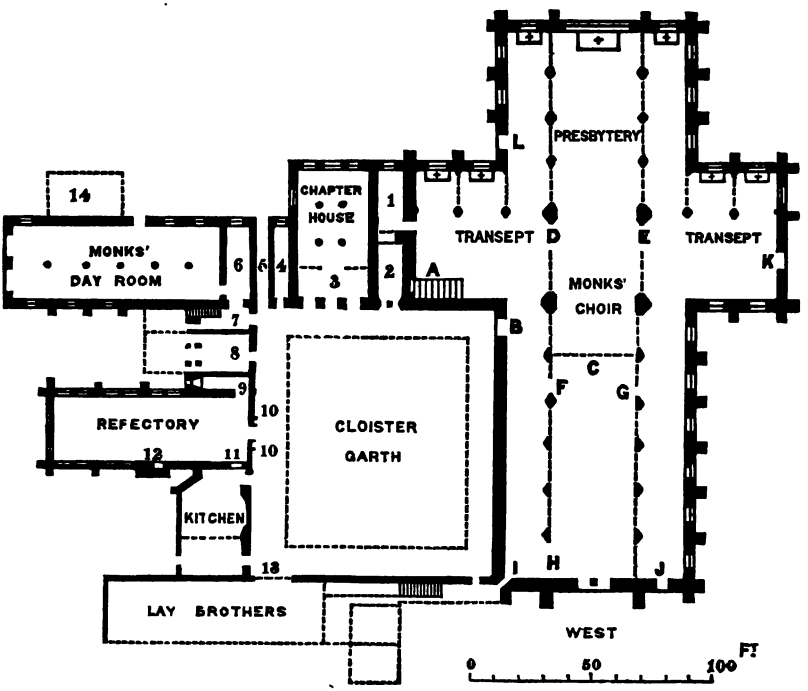
A. Stairs from Dormitory
B. Entrance from Cloister
C. Position of Choir Screen
D. E. F. G. H. Openings in stone Screens
I. Entrance for Lay Brethren
J.K. Entrances for Guests and Neighbours?
L. Door to Cemetery

1. Sacristy
2. A dark cell
3. Chapter house
4. Parlour?
5. Passage
6. Lobby to Fratry
7. Stairs to Dormitory
8. Calefactory

9. Store for Refectory
10. Lavatory
11. Kitchen hatch
12. Entrance to pulpit staircase
13. Entrance to Lay Brothers' house
14. Latrines



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ways. The monks met in chapter daily, and the abbot sat against the east wall Confessions were heard there, and there the abbots were usually buried. The room, which was probably used as the parlour, comes next. It was not a room in which to sit and receive company, but simply for speech, and that under very strict supervision. There is next a passage which leads from the cloister to the eastern precinct; the Infirmary would be somewhere in that direction.

The last room in the range was the Fratry or Day-room of the monks. It was without any fire-place, and some of its windows or arches at the north end were usually open to the weather. The sewer that ran under the buildings may be seen here.

Over the fratry, the dormitory of the monks extended; the staircase adjoined the fratry. The space over some of the other rooms would be the library, with a passage from the dormitory, for access to the church by night. The next room was handsomely vaulted and plastered—as, indeed, were the church and all the more important parts of the monastery—there was a fireplace in the centre, round which the monks could stand. It was probably the calefactory, the only place where they were allowed to warm themselves. In the later times the monks altered this portion, and built over it what is called the prior's lodging, and probably is so. The abbot, if he did not lodge here, would have a house in the precinct, but out of the cloister; he had a lodge at Tintern Parva, of which there are still some remains. We can trace here the staircase to the upper rooms, and also a fine large arched entrance opening upon the cloister walk.

The refectory comes next—a long apartment, which had handsome windows. It runs north and south, which was the Cistercian rule; in all other monasteries the refectory lay east and west. The monks sat on the sides of it, and dined at narrow tables, whilst one read from the pulpit, the entrance to which is on the western side. A narrow room on the east was used for the service of meals; on the west side is the hatch, by which the portions of food were passed from the kitchen, and near to it a curious shallow recess where a wooden ledge could be let down to hold dishes.

On either side of the entrance to the refectory was a handsome recess that formed the lavatory, where the monks washed before meals. It is much broken, and is miscalled the almonry; but the monks' alms were given out near to the monastery gate, and were of a more substantial character than anything that would be left from their own frugal meals. I confess I do not know what the broken victuals of the vegetarian *cuisine* may be like.

The kitchen comes next. There are remains of one or more fire-places; but it has been much defaced. The whole range of building adjoining the west side of the cloister was, in Cistercian houses, usually devoted to the "conversi," or lay brothers. It is possible that at Tintern the northern part of this may have been the guest-house, as the guests might not have been so numerous as to require a separate lodging. The relations of the monks with their lay brothers are worth consideration in reference to the business of a Cistercian monastery. Mr.

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Edmund Sharpe called this western building the domus conversorum, because the conversi used the lower story by day, and the upper story was their dormitory at night. The conversi were members of the Order, being devoted to prayer and labour; but they were chiefly employed in the agricultural and artificer's work of the community. They were about double the uumber of the monks, and were, in fact, their servants, having been taken from the poorest class—outcasts, from poverty or crime, who were glad to accept of shelter in the monastery, who could neither read nor write, nor could even be instructed by the monks in any of the higher arts, which the monks kept to themselves. They were dispensed from attending the night services, and had to attend only very few of the day services. Their entrance to the church was at the north-west corner. They appear to have been sleepy in church, for a preacher who observed this, once broke off his sermon, and said, "Now, I will tell you a good story." He watched the effect, and then taunted them with their miserable spiritual condition, saying, "I speak to you of God, and you go to sleep—I make a jest, and you wake up and are all attention!"

What other buildings there may have been at Tintern I know not. They would have such barns and stables and workshops as a large agricultural establishment needed for the supply of every want. All these, with the almonry, would be outside the cloister bounds where many small remains still exist. We know that the Abbey precinct enclosed 34 acres of ground, and would have a suitable gateway for entrance. The infirmary also was outside the cloister. It was not merely for the sick, but specially for the aged and infirm monks, who were no longer able to undergo the severities of the monastic rule. They were dispensed from all the regular services, and from all business in chapter and in cloister. They had a suitable diet, and were tended by young monks, who were enjoined to cheer them, and not trouble them with unpleasant news. The services were said for them in a chapel that opened out of the infirmary, so that they could join in them sitting or lying in bed. I have no doubt that the building, which at Llanthony Priory is used as the parish church, was formerly the infirmary with its chapel, now the chancel of the church.

As to the cloister itself, not a stone of it remains in situ. It had a wooden roof, and it enclosed the cloister garth, which was the burial place of the monks. On the south side of it, exactly opposite the door of the refectory, is a broken part of the wall of the church which may have contained the seat of the abbot or prior in cloister-time.

Having described the buildings at Tintern, I may now refer to the buildings erected by the other monastic orders.

The Cluniac Monks, already noticed as a branch of the Benedictines, built magnificent monasteries, generally similar in plan, but did not attain to very great popularity. They had about 30 establishments in this country, of which Wenlock Priory is one. The Cistercians numbered more than 100. The Augustinian Canons followed rules and erected monasteries, not materially different from those of the Benedictines. They differed in being, of necessity, clergy.

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They were chiefly settled in towns, and built long naves, into which they admitted the people. Llanthony Priory was an exception as regards the site, and was never a successful establishment.

The friars differed from the monks, in having no dignitaries amongst them, they were "brethren," as the name implies. They were vowed to strict poverty, even as a community; but in later times became enriched by benefactions. They endeavoured to influence the people by preaching, and therefore settled in towns, where they built some of the finest of churches. Their residential buildings were very mean, and cooped up by the nature of the sites. They have mostly been destroyed through modern improvements. But the monastery of the Dominicans or Black Friars at Hereford is a very interesting example so far as it remains.

The Carthusian Monks differed from others, in having no common living, eating, or sleeping rooms. Each had his private apartment, opening into a cloister, something like the cloister of the Vicars' College at Hereford. They lived like hermits, meeting seldom in church or in chapter, their food being passed to them through a secret trap in the wall.

At the dissolution, the buildings of the various orders met with widely different treatment. Those which had clung to the town were either preserved as parish churches, made into cathedrals, or turned to secular uses. Vast numbers of them were entirely destroyed. The most remarkable fate was reserved for the monasteries of this order. The Cistercians—and, we may almost say, they only—had selected the wilderness and the solitary place for their retreat. Their lands being at the dissolution granted to private persons, the buildings were found to be useless, whether for ecclesiastical or for agricultural purposes. They were hardly worth pulling down. Allowed to fall into decay, the leadwork, the timber, and more or less of the stone were taken for use in the buildings of the neighbourhood. It is said that at Tintern, the lead roof remained until the time of the Commonwealth; but time, more than the hand of man, has made the ruin what it is. As the palæographer tries to decipher a blurred and tattered manuscript, written in a strange hand, and in a language that is dead—as the geologist studies in the *débris* of a quarry the conditions of things before the ages were reckoned, so we peer back through the dim medium of five centuries into this secret corner of the mediæval world.

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THE SPANISH CHESTNUT AS A SUBSTITUTE FOR OAK.

[Read by Mr. THOS. BLASHILL, at the Midsummer Hill Meeting, June 19th, 1877.]

OUR transactions for the years 1866 and 1867 contain interesting discussions, growing out of a paper by the Rev. H. COOPER KEY, on the varieties of Oak, *quercus pendunculata* and *Q. sessiliflora*, in the course of which mention was made of the supposed occurrence of the timber of the Spanish chestnut, *castanea vesca*, in English mediæval carpentry. This question is of sufficient importance to be the subject of independent consideration, for, besides the interest which it possesses in a practical point of view, it furnishes one of the most curious instances of popular delusion.

Sir Christopher Wren, writing about the roof of Westminster Hall and Abbey, accounts for the unsatisfactory condition of some parts of them by the practice of mediæval carpenters to work "their chestnuts from Normandy." But Evelyn seems to have had a better opinion of the timber, for he says, "it is much sought after by carpenters and joiners." White, of Selborne, from his own inspection of some old trees, says, "the timber and bark are so very like oak as might easily deceive an indifferent observer," and mentions that it has sometimes been passed off as oak in the Royal dockyard. But he observes, that the wood is "very shakey," so that the inward parts are of no use—which we find to be true of old trees. About a century since, White's correspondent, the Hon. Daines Barrington, was at great pains to examine into the question of the ancient use of chestnut, but could get nothing better than the loose statements of carpenters who had adopted the theory which was probably older than the time of Wren. Yet the popular idea remained so strong in its favour, that, in 1808, the Society of Arts offered prizes to those landowners who would plant the greatest number of chestnut trees on their estates. Since that time the chestnut has been much cultivated, and the wood of mature trees has now been available for several years, being frequently used in situations that are usually considered too trying for any timber but oak. This question has therefore assumed a practical interest, for carpenters and others engaged in building, are very generally of opinion that the best specimens of timber found in our old buildings are of chestnut, and will act upon that opinion whenever they have an opportunity of substituting chestnut for oak.

Now, there is only one way of bringing this question to a satisfactory and conclusive test—it is to examine undoubted specimens, recently fallen, of chestnut

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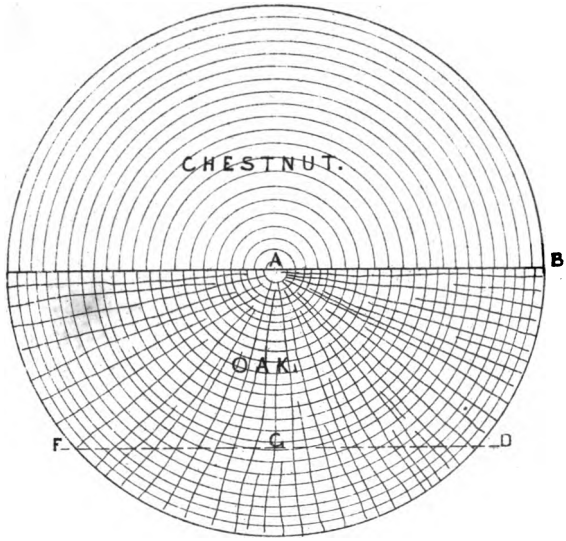
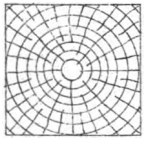
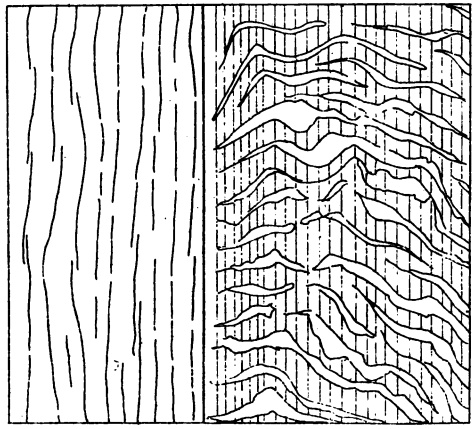




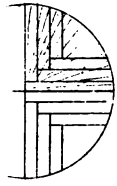
Beam or Rafter
in which the Silver grain will not be conspicuous.



OAK.

Cut **F** *to* **C**.
shewing cross sections of the Medullary plates

Cut **A** *to* **B**.
so as to expose the Medullary plates and form the "Silver grain"



Oak "Quartered"
to shew the Silver grain in floor-boards or panels

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and oak, and to note their characteristics. We can then apply the knowledge so acquired to the examination of any old timber that may be asserted to be chestnut, and decide confidently as to the fact. It happens that for many years I have been in the habit of using chestnut timber; first seeing the trees fallen, and afterwards watching the process of converting the timber to various purposes. I exhibit specimens grown in Herefordshire and in Essex, together with specimens of oak, some being of recent growth, and others taken from buildings erected in the fifteenth century. From these it will be seen that the two kinds of wood are distinguished by very clear marks. The medullary rays, which form a very curious and interesting part of the anatomy of exogenous trees, are, in most kinds of wood, so faintly marked as not to be visible to the naked eye, although they are very distinct under the microscope. They are, however, very clearly visible without such aid in the cross-section of all the species of the oak that I have seen, and they are especially noticable in our English species, radiating in clear bright lines from the centre towards the bark. They vary a good deal in the closeness with which they are arranged and the thickness of each ray, they are, however, always perfectly distinct, although in old timber there are variations in colour that sometimes render it necessary to look closely at the cross-section in order to distinguish the ray from the intervening tissue. These variations are probably due to such causes as have determined the habit of growth of individual trees. Thus the timber of oak trees grown in hedgerows will be of coarser texture than that grown in moderately thick woods, and considerable variations are due to soil and climate. Generally, in quick growing timber, the rays are further apart, and in such as is of straight and clean growth, the vertical plates, of which the rays are composed, are of more even shape. In all the American oak timber that I have seen, the rays are very distinct and far apart, the timber being very straight and probably of rapid growth. The most conspicuous effect of the medullary plates, is, however, seen in the vertical sections of an oak tree, taken as nearly as possible through the centre, when the exposure of parts of each plate causes the beautiful pattern known as the silver grain, so much valued in wainscot, and particularly in gnarled specimens of English oak. The same effect may be seen in a very slight degree in the wood of the beech. But no such effect can be observed in any specimens of Spanish chestnut, whether we look at the cross-section or the vertical section. It is therefore impossible for anyone who really knows this distinction to mistake chestnut timber for oak whether it is old or of recent date.

And yet there is scarcely an old roof of any importance, for size or beauty of design, that has not been reputed to be of chestnut timber. The halls at Westminster, Hampton Court, and Eltham Palace are the most familiar instances, the popular belief now being almost wholly in favour of the superior excellence of chestnut when compared with oak. It is very common to meet with old workmen who are confident that they can distinguish the two woods, and who will pronounce any very well-preserved specimen to be of chestnut. One sometimes finds a man who holds a contrary opinion, and one such, a country builder of great

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practical experience, has kindly furnished me with a description of the timber which he finds in old buildings, and recognises as chestnut. He says :—"It is of a dead chocolate colour; decay commences in the interior of the timber, accompanied by large quantities of powder, which is seldom found in oak; the wormholes are large, and the timber gives way by breaking straight across the fibres, instead of splintering as does oak. It is of a dead nature, and yields to the chisel uniformly in every direction. It does not ring when struck; there are no starlike rays in the knots; the sawdust is dark and of an unpleasant smell."

Most workmen will say that if a nail is driven into oak it will cause the wood to become black, while chestnut will remain unchanged in colour. Chestnut is also said to be proof against all attacks of the worm, but the specimens of Italian furniture at the South Kensington Museum, labelled "chestnut," show wormholes pretty freely. But I am inclined to think that this is really walnut, which is the wood of which Italian furniture is usually made.

But, although I have obtained many specimens of so-called chestnut from persons who fully believed that they were able to discriminate them, every one of them has turned out to be oak, varying in colour, or hardness, or degree of decay, as we might expect oak timber of great age to vary. And although I have enquired of the persons most likely to meet with chestnut in old buildings, I have always found such persons unable to give an instance of its occurrence. Sir Gilbert Scott has recently written to me in effect that he knows of no instance, nor yet of any mediæval record of its use. The eminent French architect, Mons. Viollet le Duc, says, in his dictionary, that during the middle ages, at least, in France, oak was exclusively used for the joinery of buildings. I hear from a friend who has discussed this matter with him, that he knows nothing of the use of chestnut in roofs. Yet it is not uncommon to meet with a very positive statement that some roof of a French Church is of chestnut, and there is in Normandy a strong opinion that chestnut was anciently used there. Now, Normandy resembles England in the scarcity of the chestnut tree, both countries being further northwards than the districts in which it flourishes, but the theory by which its presence in old roofs is accounted for, makes England the source of the supply! Beyond a very slight notice of the growth of chestnut, near London, about the time of Henry II., I know of no record that tends to show its existence here in any quantity, previously to the great efforts made to promote its cultivation early in the present century. There are, however, cases where it was planted, to a small extent, of which the magnificent avenues at Croft Castle, in Herefordshire, and Betchworth, in Surrey, are examples.

The chestnut is said to have been introduced into Italy by the Romans, from Castanea, in Thessaly, and it would be strange if they had made no effort to introduce into this country a tree so beautiful and of such utility. But our climate forbids its flourishing, by natural increase from seed, to any great extent. It is not until we get so far south as the centre of France, that the chestnut

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becomes a marked feature in the landscape. It is said to flourish wherever the vine flourishes, and, as it is much used for casks, that is looked upon as a providential coincidence. But it is chiefly as a fruit-bearing tree that it is valued, and in an estimate made some years ago, it was reckoned that one hundredth part of the food of the French people was derived from this source. In Auvergne, the fruit is preserved in earth, and made into flour for bread. I have seen, on the quays at Bordeaux, chestnuts heaped up as plentifully as potatoes are with us. In Perigord and Limousin, whole parishes are covered with chestnut trees, and in that vicinity alone, there are a million and a quarter acres of chestnut woods, producing fruit of the value, in some cases, of 33s. per acre.

In Italy, the chestnut abounds in all hilly districts. Virgil could boast of his "ripe apples and soft chestnuts." One cannot traverse the more picturesque parts of that country without being impressed by the luxuriance of its foliage, and the grand contortions of the spreading stems and branches. It is the tree of Salvator Rosa's pictures. Milton, who had seen the immense forests that clothe the flanks of the Apennines, tells us, in his great epic, how the fallen angels lay—

> "Thick as autumnal leaves that strew the brooks
> In Vallambrosa, where the Etrurian shades
> High over-arched, imbower ———."

As a planted tree, the chestnut, with us, shoots up straight and soon forms a good large trunk. After a growth of forty to sixty years, the tree begins to twist so decidedly that it becomes shaky and unsound in the interior, but while young it is a very clean and useful wood. It is remarkable for the very small amount of sap-wood it contains, consisting usually of not more than about three of the outer rings. Mr. Gladstone, speaking as a woodman, says "the pleasantest timber to cut is Spanish chestnut, because it comes away so freely, the grain breaking easily." When freshly cut, the timber looks somewhat like oak, but the rings are much wider, and the wood is much lighter. Of two dry specimens that I weighed, the oak showed 43½lbs. to the cubic foot, the chestnut only 33lbs. When the timber is seasoned, it is hardly more like oak than is the timber of the ash or elm, and could not possibly be mistaken for oak by any one who knew oak timber.

As to durability, I have been unable to find any reliable evidence of its resistance to weather when exposed to the alterations of moisture and dryness to which we confidently expose oak. We have in this county a pretty good instance of its failure in this respect. The bridge over the Wye at Hoarwithy, built about nineteen years ago, was made of chestnut, in the belief that it would be as good as oak, but it decayed so seriously that it was for some years propped up, and is now being replaced by an iron bridge. The decay was chiefly at the joints, the remainder of the timber being very sound so far as I could see. Upon the whole I consider the wood of the Spanish chestnut of great value for ordinary purposes, but not to be brought into competition with oak. As to its use in mediæval carpentry, we are, so far, without any reliable record of its discovery in any

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ancient building, the oldest specimen that I am able to produce being, one from Old Shelsford Hall, Oxon, dating from about 200 years ago.

NOTE.—1886. Soon after this paper was written, I found in the museum at Kew a piece of oak labelled, "Spanish chestnut, from an old beam in Windsor Castle." The Curator was very easily convinced of the error and had it corrected. More recently, and in consequence of some extensive enquiries which I set on foot, Mr. Harry Hems, wood carver, of Exeter, sent me a piece from the 15th century rood screen of Rodmersham Church, Kent, which I have no doubt is Spanish chestnut, and is the only instance of its use that is publicly known at the present time.

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Woolhope Naturalists' Field Club.

ON Thursday, September 20th, the members made an excursion to that special district from whence the Club takes its name. Starting at 10 o'clock from Broad-street, Hereford, in a carriage drawn by three greys, they drove to Mordiford, and at the bridge over the Lugg, found the Rev. F. Merewether and two visitors awaiting them. Alighting opposite a public-house bearing for its sign a full moon with a particularly jovial aspect, they walked up the road leading to Haughwood, till they came to a cutting about 9ft. deep, on the left-hand side. Here the party, increased by the arrival of two former presidents, James Rankin, Esq., and the Rev. James Davies, arranged themselves to listen to an address on the "Geological Drifts of the Neighbourhood."

Mr. Merewether, after pointing out that the road itself was on the drift, shown by the worn banks of the brook, called the "Pentelow," on the one side, and the cutting on the other, proceeded to say where it came from—the Woolhope Valley; how it came—by aqueous action, and described it as a mass of friable loose earthy matter, containing rounded and angular fragments, principally of Wenlock limestone, intermixed with fossils, shells, and corals, generally too abraded to specify; as differing much in thickness, from one or two feet to fifty or more; as being always found in largest quantity opposite any break in the edge of the Woolhope basin, especially on the south-west side; as extending to Fownhope, and to be seen exposed in places on the roadside, to which he would presently conduct the club, and concluded by saying that up to the present time the great mass of the drift had never been recognised or described.

A few questions were now asked and answered. A search for fossils was made by those who came provided with hammers, and the party were just about to follow up and trace the drift, when Mr. Merewether pleasantly surprised them all, by producing and reading a second paper on the "Probable existence of an extensive lake that had at some time filled up the valleys of the Wye, Lugg, and Frome."

The naturalists were then led to the places on the road to Fownhope, spoken of in the first paper. The best exposure is close to the river-side, beyond the old mill. It is rather difficult of access, but well worth the trouble. On passing the Green Man, at Fownhope, it was remarked that Sir Roderick Murchison had stayed three days in that house without noticing the drift, although it was facing him. At Fownhope, the church was visited, and the tympanum inserted under

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the east window was duly inspected. It was noticed that a stocks, or as Johnson explains it, "a prison for the legs," still was to be seen, close to the churchyard gate. A pleasant stroll through the fields, past the dried up salmon pool, brought the party to the Scutterdine Quarries, and into the road where the address was given in the morning, thus making a circuit of the Westwood and Cherry Hills, which form the south east edge of the Woolhope basin. The carriages were in attendance at Mordiford, to bring the members of the Club back to dinner at the Green Dragon, after which the first thing done was to pass a vote of thanks to Mr. Merewether for his kindness in preparing and reading the papers.

The Rev. JAMES DAVIES, read an account of some customs, almost, if not quite, obsolete, which he considered peculiar to this county. Many of the usages that he spoke of were curious and very interesting; sin-eating at funerals, for instance, was a practice that nobody present had seen, though many had heard of it.

Mr. RANKIN then read a very elaborate and carefully drawn-up paper on the "Difficulties of estimating geological time."

Both these papers were listend to with great pleasure, and the cordial thanks of the meeting were unanimously voted to the gentlemen who had written them.

THE REV. F. MEREWETHER'S PAPERS.

THE following papers were read by the Rev. F. Merewether, at the meeting of this club, on the 20th September. As we have stated, a large party drove to Mordiford; and the papers were read at a deep cutting on the left-hand side of the road leading to Haughwood, the party having by that time received several additions since its departure from Hereford.

"GEOLOGICAL DRIFTS OF THE NEIGHBOURHOOD."

It is a source of great satisfaction to me that the Club has made its meeting here, because it gives me an opportunity of pointing out to the members the different beds of drift which I described in the paper I had the honour of reading some years ago on Backbury Hill; and the more so, as the facts I then stated were not only unsupported by any other authority, but are entirely opposed to the positive assertion of a statement which appears in the volume recording the transactions of the Club in 1866. In an article entitled "Definitions of Districts with Notes on their Geology," in describing the district of Woolhope, in the very first sentence are these words: "Mordiford, at the north of this district, is well worthy of the attention of Geologists, as it is the *only* locality where any amount of *débris* is collected of the immense masses of rock that have been denuded." This you will, to-day, have an opportunity of proving to be incorrect. But not only this writer, but even Sir R. Murchison must have been labouring

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under the same delusion, or he never could have written the following. In alluding to Woolhope, he says: "One of the most striking features for the consideration of the Geologist is, that neither the central dome, nor the surrounding ridges, including the outer encircling ring of Ludlow rocks, offer a trace of drifted matter, or gravel, or even any remains of the various strata which must, in the process of elevation, have been demolished. All the *débris* resulting from the destruction of this once great solid mass has therefore been swept away, the tract being one of clean denudation." And again, speaking of the great erosive power of water, he says: "What other agency will account for so complete a denudation, the broken materials having only found issue by one lateral gorge?" Seeing is believing, and to-day you will have the opportunity of disproving these assertions. In proceeding from this place I shall first call your attention to a development of drift, on the other side of the little stream of water running below us, called Pentelow, at the back of the Bell public-house, now, however, nearly hid by a faggot pile, though sufficient is still visible to justify the opinion that previous to the formation of the road, and the erection of the mill, it was part of the main body of drift, and was continuous. The road for some distance towards Serpent's Lane on the left, about 200 yards from this spot, is cut through this drift. There is a curious tradition about this Serpent's Lane; namely, that a large and fierce serpent, which lived in Haughwood, used to come down this lane every night to drink in the Wye. And I was often told when I came into this neighbourhood (now five and thirty years ago) that many persons recollected the effigy of a serpent or dragon painted on the wall inside the church at Mordiford. I have read in some old book that in the reign of Richard II. (I think it was) the road between Mordiford and Fownhope was rendered unsafe for travellers from the depredations of a noted robber who lived in the adjoining woods, and I strongly suspect this was the origin of the serpent. After passing this lane at the bottom of the hill just before coming to the bridge, there is on the left hand side a bank of drift upwards of 100 yards in length, and certainly 50 feet above the river, which runs immediately beneath the road on the right. This drift continues all the way to the Anchor public-house. About 300 yards further on, on the left hand side of the road, is another considerable section of drift, which has been cut through by the road. About the same distance, at the Brewery, now called the Rock House, there is a fine section of the Upper Ludlow rock. A little way further on, on the right, close to the river, is a large mass of drift. This will call for your especial attention, and, in my opinion, is the finest section of drift to be seen anywhere. It must, when first formed, have been of enormous dimensions. Even now, at the distance of 300 yards from the opening in the outer ridge of the upheaval, it is at least 30 feet high, and from the contour of the adjoining land, must have been of great extent. It cannot be supposed that when the drift was washed through that opening it assumed the scarped appearance now presented, but must have flowed onwards, and terminated in a talus. Judging from a quantity of drift which is now visible at a distance of at least 100 yards, from a bank of drift in the village of Fownhope (though the intermediate

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part is gone), it is, I think, fair to assume that this immense bank of drift, which is so incalculably larger, must have extended, certainly, beyond the course of the present river, and in all probability for a considerable distance into the opposite meadow. All this, however, is now washed away. An inspection of this bank of drift will convince any beholder, as it has me, that there must have been more than one outflowing of *débris*, because we see the large and heavier pieces of stone resting on a layer of sand; whereas had both been deposited simultaneously, the stones, from their gravity, would have been at the bottom, and the lighter sand resting upon them, whereas the reverse of this is the case. In the village of Fownhope, about a quarter of a mile from this spot, is a bed of drift on the left hand side of the road, extending from the bridge opposite the Post-office to a draper's shop nearly opposite the Green Man Inn. Those members who are fond of archæology will be well repaid for walking as far as the church, where, on the outside of the west end, is a curious sculptured Tympanum, similar to those at Stretton and Brinsop. I may here repeat what I stated in my former address, that wherever there is a notch or gorge in the outside edge of the valley of elevation, there is sure to be a bed of drift opposite it—at least this holds good for the S.W. side. The only places where I have been able to discover drifts, are along the road leading from Mordiford to Fownhope, and the outflow appears to be confined entirely to this side of the valley of elevation; at least, thanks to the road, this is the only place where it is at present visible; for, from the gorge at Mordiford, where the Pentelow brook now runs, which is somewhere about N.W. from the village of Woolhope, proceeding round the valley of elevation, to the S.E., there is not, as far as I am aware, a single break or notch in the outside formation, through which it is at all likely that drift was ever washed. The road to Woolhope, from Fownhope, where we are now supposed to be, passes through a very distinct gorge, and down this, at the time of the elevation of the valley, supposing it to have taken place when covered by a sea, of which there is little doubt, an immense body of water must have rushed, scouring out the pass, and leaving no signs of drift, till the waters had room to expand themselves, as was the case under Mr. Lechmere's house, where they have left the bank of drift last alluded to. Thus, gentlemen, I have brought you to Fownhope, and to the conclusion of the remarks on what I have undertaken to point out to you; and I think, from the occular demonstration you have had, you will be disposed to admit that so large a body of drift as you have seen, is more extensive than any written description of this district would have led you to believe existed. But, besides these beds of drift which are visible, there is a tract of land close to the Court Farm, almost in the very centre of the valley of Woolhope, through which an open drain has been cut, and an opportunity has thus been given of proving that an area of two or three acres has been covered by drift. This, however, is not visible now, but during the dry weather in the summer is easily perceptible. To summarise the different drifts, we have, first, that at Mordiford, by the side of the road leading to Woolhope, through Haughwood; then the high and long bank of drift opposite the bridge leading to Holme Lacy; the drift at the turn of the road,

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about 300 yards further on; the great mass of drift on the right hand side, where the river approaches close to the road; and the drift on the left hand side of the road, in the village of Fownhope, between a bridge over a small stream of water and a draper's shop nearly opposite the Green Man Inn.

"PROBABLE EXISTENCE OF AN EXTENSIVE LAKE THAT HAD AT SOME TIME FILLED UP THE VALLEYS OF THE WYE, LUGG, AND FROME."

There is another subject on which I wish to offer a few remarks, and if this were not in all probability the only opportunity I shall ever have of pointing out some of the features which tend to the formation of my belief, I should certainly abstain from doing so. It is my firm conviction that at some very distant period, long ago, the whole of the flat land extending from beyond Weston Beggard, under Longworth, Moreton, as far as Dinmore, part of Hampton and Rotherwas, the whole of Lugg Meadows, the land between Holme Lacy and the road we have travelled over to-day, extending to Capley (where, I conjecture, the dam was), the whole of this land, I repeat, was at one time covered with water and formed a large lake. My reasons for such an opinion are, that at the present time, in many places, the supposed banks, if I may so term them, show the abrupt appearance of having been water-washed. This is the case at Lugwardine, under Newcourt and Sir Herbert Croft's house; at Tidnor, under Sufton on the bank between the road and the river Lugg, at Mordiford, Evenpit, thence under the road nearly to Fownhope, distinctly just above the Lea Brink, still more so between that place and the rock cottage; and again at and near Capley. These are all on the left bank of my supposed lake. On the right, under Dinmore hill, between it and the river Lugg, on the bank about half way between Moreton Station and Hereford, on both sides of the road leading from Hereford to Lugwardine at the Lower House (Tupsley), just beyond Dinedor Court, on the red bank, both above and below it, under Holme Lacy Park, under a hop-ground belonging to a farm called Hollanton, and under Ballingham Wood to Capley. All these places have steep abrupt banks, and it is impossible to account for so level a surface as the intermediate land presents, except by the subsidence of mud held in suspension in water, which by gravitation, would fall to the bottom, and thus form such a dead level. This could only take place in still water, which, when drained off, would leave a large soft muddy bottom, through which the rivers Wye, Lugg, and Frome would experience no difficulty in making a passage. The opponents to this lake theory will say that the river is the cause of the accumulation of all this alluvial deposit, and that the abrupt and steep appearance of the bank at different places is caused by the river having changed its course, and run at different times over every part of the low ground. The same "running powers" must be conceded to the Lugg and Frome; and it is not consistent with probability that these two small rivers should have taken such erratic courses, and have left an alluvial deposit 1000 times greater than that of the river Wye, which is five times as large as both of them put together. Rivers, in my opinion, do not alter the course to any great extent; they get deeper, that is, the bottom of the river

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gets deeper from the level of the banks and whenever they encroach on the adjoining land on either side, they leave on the opposite convex side of the bank a deposit of gravel or shingle, which in time is silted over and becomes meadow land, but there is always a visible mark left to show what has taken place. Granted, that a succession of floods might have accounted for the great amount of alluvial deposit; this does not account for the abrupt appearance of the bank at different places; the deposit brought down by floods would unquestionably have had a tendency to fill up the intermediate land, but not to scoop out the banks on either side, which bear evident appearance of having been water-washed, and at a level far higher than any floods have been known to extend. Such an event as I have endeavoured to demonstrate is not at all unlikely to have occurred. Just above the town of Kington, in this county, there is a farm called "The Lake," through which a little stream of water called the "Back Brook" runs, with low flat ground on either side of it; and close to the town there is a place called "The Broken Bank." These facts speak for themselves. The river Shannon runs, I believe, through a succession of lakes, and my firm belief is that the river Wye once did the same. There are evident marks of a lake below Glasbury, which, I think, extended nearly to the Hay. Again at Letton, on both sides of the river as seen from the railway bridge at Strangwood, extending under Caple wood and Lynedown to the Hole in the Wall, at Backney, Ross, Goodrich, and at Huntsham, which latter place is the limit to my knowledge. But with respect to the subject of these observations, I think we may rest assured that God, in His own good time, saw fit by some operation of nature, as we call it, to drain off the water and "bid the dry land appear," and thus convert what was useless and barren into some of the best and richest land in this beautiful county.

THE REV. JAMES DAVIES'S PAPER.

THE following is the full text of the Rev. James Davies's paper, which was read at the meeting of the Woolhope Club, on the 20th September :—

"OLD HEREFORDSHIRE CUSTOMS."

Although the overspread of railways has wrought such a change in the speed of the march of intellect, that probably not even the most old-fashioned English county can plead ignorance of the meaning of the word "obsolescense,"—that is, the gradual dying out of old customs—I consider that Herefordshire, owing to its bad roads, absence of manufactures on a large scale, and purely agricultural population, must have had as good a field, both for possessing and retaining such, as most. If "trade's unfeeling train," which in a non-natural sense may for the nonce be taken to mean "the iron horse," has now "dispossessed the swain" of not a few of these, it is of less practical use to lament and regret them, than to endeavour to gather the remembrance of them into a pious record, and to discriminate between the good, bad, and indifferent, to the end that those which are capable—as some certainly are—of being utilised and applied, may revive, at any rate in the memory, whilst the others may either, where harmless, though vulgar, give food for our educated complacency, or, where simply superstitious, minister,

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by their desuetude, to our practical growth of common sense and cultivation. I do not doubt that many of the customs I am about to refer to, may have their counterparts in other counties, but it will not be supposed that Herefordshire's title to them is unreal or shadowy, if in each case I can cite a *locus in quo* within the limits or on the frontier and border of the county in which we are met. In preparing a paper on the subject, it may be premised that I have been much beholden to Duncumb, the historian of the county; to *Brand's Popular Antiquities; The Book of Days;* and last, not least, to *Notes and Queries.*

To begin then with Christmas, and not to dwell on the "waits," whose gatherings at that season, in other counties, are very graphically described in Mr. Hardy's amusing novel, *Under the Greenwood Tree*, and who seem to have given place, in many parts, to the carollers, who more considerately allow their well-to-do neighbours to sleep till six o'clock in the morning, there are one or two special Herefordshire customs about that season, which still, to our knowledge, survive. On good St. Thomas's Day (December 21), the old wives still go "a-Thomasing," or, as Worcestershire folks would say, "a-corning," in allusion to the custom both in that county and this, of their carrying a bag in which to receive in kind from the farmers and landowners, the contribution of corn, which is, we suspect, now generally commuted for a money dole. It was in my recollection, in the neighbourhood of Kington, on this day that some of the old women who went "a-Thomasing" used to bring the good lady of the court the yarn which they had spun, and thereout to earn an honest penny in addition to the customary gratuity. I doubt whether mumming is really at all indigenous to Herefordshire; and of course, the yule log, Christmas carol, and like Christmas customs are too universal to demand special notice. Perhaps we ought to say, that though Herefordshire yields to no county in its customary decking its churches with ivy and holly at Christmas-tide, we have never heard of such a solecism and unseasonable addition as the poet Gay associated with them in his *Trivia* (ii. 437). The mistletoe, though that is quite a special growth and almost weed of the county, and not only furnishes truck loads to London, but finds its place in the kitchen, servants' hall, and nursery of most of us, certainly does not help to deck our churches. Duncumb affirms that on Christmas Day it was reckoned bad luck if a female was the first to enter the house in the morning, and the same custom, with variations, is found to have existed in the North and elsewhere. His explanation, that "all thrifty housewives should be at their own household affairs," seems scarcely a reason why the sterner sex should enjoy the monopoly of gadding about on that day especially. Upon the feast of Stephen, it was, and is still in old-fashioned farms, a Herefordshire rule to bleed the cattle; as it was in the days of John Aubrey, the 17th century chronicler, who, with his sire and kinsfolk, had property in Burghill and elsewhere in this county, to bleed also the cart horses. The true reason for this, is one which in these days we are sorry to find lost sight of. "With St. Stephen's Day, are three days of rest," says a writer of the middle of last century, "or at least two." Are our modern tenants generally learned enough and sufficiently observant in the calendar to see the point of this? A more curious

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custom was to be noticed in our boyhood, in several parts of this county, on the eve of Twelfth Day, I mean "Burning the Bush." A writer in *Notes and Queries*, in May, 1852, testifies to having noticed the custom in the previous spring, in Herefordshire, probably then with the springing of the later sown wheat. "When the wheat," he says, "is just springing out of the ground, the farmers' servants rise before daybreak, and cut a thorn branch of a particular kind. They then make a large fire in the field, in which they burn a portion; the remainder is afterwards hung up in the house. This they do to prevent the smut or mildew affecting the wheat (*Notes and Queries*, vol. v., 1st ser., p. 437). The writer doubtless had made his observations perfunctorily, or else at the later ceremony of burning the bush, details were not of so much concern as on Twelfth Day Eve. At that time the custom was for all the servants of every farmer to assemble in one of the fields that had been sown with wheat. At the end of twelve lands they made twelve fires in a row, with straw, around one of which, larger than the rest, they drank a cheerful glass of cider to their master's health, and then returned home to feast on cake made with carraways and soaked in cider. Duncumb, who perhaps confuses this custom with "wassailing," or "health wishing" proper, because that is a feature in it, noted thirteen fires on the growing wheat, traces the custom to the Roman festival of Ceres, and adds the peculiar custom of the visit of the farmer and his household to the wainhouse on return from the field, when a toast was proposed, a cake stuck on the horn of a favourite ox, which cake, according as the ox, when tickled, threw it fore or aft, became the property of the bailiff, or the lowest servant. The fires are said to represent the Saviour and His Twelve Apostles. We have missed, in its order, an ancient custom which in some parts of Herefordshire (Duncumb specially mentions Dinedor) was associated with "Holy Wells." The subject of wells, and the honour and adoration paid to them by the heathen, for their supposed healing virtues, is large enough for a volume in itself, and is ably and compendiously put in Mr. D. R. Thomas (a brother archæologist's) valuable *History of the Diocese of St. Asaph*. Here we are only at present concerned with what Duncumb says was a custom as regarded the well in Dinedor parish, in his day. "Each New Year's Day there was a contest there for the first pailful of water, which was termed the "cream of the well," and presented to some neighbour as a mark of respect and pledge of good fortune." The custom, in truth, is more homely and unromantic than many we wot of elsewhere, especially in Wales, anent wells and their legends. It does not realize the finer fancy of the old dramatist, as to

> The spring that with its thousand crystal bubbles
> Bursts from the bosom of some desert rock
> In secret solitude, which may well be deemed
> The haunt of something purer, more refined,
> And mightier than ourselves.

Mr. Mucklestone informs me that on Mr. Oatridge's farm, there is a very remarkable spring, to which people from a distance used to resort, for the cure of sore eyes and other ailments. He believes that the rivalry for the "cream of the well" was an institution of "long, long ago" in Dinedor, but not in the memory of any one now living. On the other hand, it does not descend, as some customs

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do, to a meaningless roughness and rowdyism. We read apropos of St. Kenelm's Wake, at Klent Church, in Salop, on that Saxon Saint's Day, the 17th of July, "there was a singular custom of pelting each other with crabs (whence it was nicknamed 'crabs' wake'), and that even the clergyman seldom escaped, going to or from the chapel." It is hard to see what this usage could have had to do with the youthful martyr, St. Kenelm; but perhaps I need not tell you that this "pelting with crabs" is still, as it ever has been, a customary ceremony of certain Herefordshire wakes. Traces of it are still to be found in the "Golden Valley," at Urishay, Dorstone, and Fowmind feasts; and I am informed by an eye-witness of intelligent and accurate observation, that pelting with crabs is, to this day, a popular accessory of a parish wake not more than two miles from my own doors. We forbear to quote from Brand the vulgar explanation of the institution of "crab-bing the parson," which ascribes it to the clerk's retaliation in crabs for a casual dumpling or two, which the parson had secreted in his sleeves, and which fell, peradventure, on the head of sleek John, after which he commenced proceedings, with the notice—"Two can play at that, master."

I pass over various other customs for one which is especially Herefordian, and which I trust will long continue so—I mean the practice, after primitive custom, of regarding the fourth Sunday in Lent (Mid-Lent Sunday) as Mothering Sunday—"The Sunday of Refreshment" in the midst of our solemn fast of 40 days, whereon children visit their parents, young apprentices and girls who have left the parish school for domestic purposes, come back to get a brief, but whole-some, and often blessed taste of home and the parish church; and all seems fit and meet for the Sunday of reflection, in that the Gospel for the day exhibits the Saviour miraculously feeding five thousand, and the first lesson in the morning contains the story of Joseph entertaining his brethren. The Epistle, too, has its ancient fitness in the words, "But Jerusalem, which is above, is free, which is the mother of us all,"—a text on which I may be pardoned for saying that it was once my lot to preach in the Cathedral Church of this city, on Mid-Lent Sunday, and to find a query in *Notes and Queries*, shortly afterwards, from a casual visitor at the Cathedral upon the Sunday night in question, asking for more particulars of the custom. In the ancient notices of the custom, one reads of a tribute of cakes to the old folk at home, which is a natural requital of their cares of nurture. An easy transition made this, in Christian ages, an offering at the high altar. The Simnel cake, still not wholly out of date at Ludlow, Shrewsbury, Gloucester, or, I dare say, in some parts of Herefordshire, is a remnant of the old custom—a very rich cake (to my experience), of which a little goes a long way, and of which the crust can never have been meant to be eaten, inasmuch as it is of the constitution of mortar, spiced with more or less saffron, and, it might be surmised, also with mustard.

I need not dilate on the advantage of cherishing a custom like this, so adapted for the purpose of keeping fresh and lively the blessed memories of home, and of raising the hearts of the young, who have just entered the battle and tur-moil of life, to the mother of us all, through the most pure of all earthly affections.

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But I must not forget, in this locality, this metropolis, so to speak, of the border and the marshes, one other characteristic custom, of "Flowering Sunday"—decking graves with flowers, especially on Palm Sunday, or, in some cases, Easter Sunday—which is a time-honoured institution still of Dean Forest, in "the Eye between the Severn and the Wye," as it is in many parishes also of Herefordshire. In the former district the eve of Flowering Sunday 30 years ago resembled a crowded fair, each rustic party bringing its baskets of the brightest and sweetest flowers that honour to the dead could raise or purchase, to deck the grave of its "not lost but gone before" ones, in loving simple token of the sure and certain hope of their blossoming anew one day and rising afresh to a revival in life everlasting. Each year the same pious task is sped by the same or kindred hands; and in some instances the flowers are planted and nursed in parterres within the allotted grave enclosures, whilst in others, as I myself witnessed last month in the churchyard of a border parish (English Bicknor), there are evidences of a constant unfailing service of fresh flowers, as the last-placed ones fade, from year's end to year's end. It is at such a service as this that Malkin, the scholarly and graphic author, in the beginning of this century, of the Scenery Antiquities, and Biography of South Wales, remarks—"My father-in-law's grave in Cowbridge church has been strewed by his surviving servants every Sunday morning for these twenty years." What can be more appropriate or significant than this constant tribute "to fair Fidele's grassy tomb," what better corrective to the selfishness which is apt to bury its dead out of remembrance as well as out of sight, and to regard the floral wreaths and garlands of a decked grave as "sweetness wasted on the desert air"? Another custom of a kindred kind is the decking houses with green boughs on the first of May. Whether it has gone out of use in the last few years I cannot say, but when as a boy I lived in the town of Kington, no house, I well remember, was without its bough in the doorway, of green birch; whilst oak-boughs, with oak-apples, if there were any, would be seen in the same place, on the 29th of May. Are birches as much planted in these days as in the days when the now almost forgotten institution of flogging, necessitated their growth? Perhaps not, though there is no prettier or more graceful tree than the "Lady of the woods," nor one which could come into leaf so seasonably for the May-Day door-decking. I have now mentioned most of the customs to which Duncumb refers, that of cutting finger-nails on Mondays by preference, being trivial and obsolete; that of killing our pigs towards the full of the moon (that the fat of the bacon may not be dissolved in the boiling), a question for housewives, rather than archæologists; and that of harvest suppers, a custom still observed, in some neighbourhoods, in connection with the Church's services and thanksgivings, in others independently, and farm by farm. Where a parish is of manageable dimensions, I can conceive nothing better than a combination of the gentry, clergy, and employers, for a united festival and thanksgiving collectively. But, to pass out of Duncumb's margin, there are one or two customs of singular character which he has strangely overlooked, and a good many which he probably viewed as too much in common with those of other counties to demand notice. And yet in reciting our customs, a Herefordshire man would do wrong to make

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no mention of the Curfew Bell, as to the origin of which the general belief is that it was of Norman origin, in so far as it was William the Conqueror's enactment that all people should put out their fires and lights, and go to bed at the 8 o'clock bell. Nothing is more common in the old record of parish charities than to find bequests of land or money to provide for the ringing of the 8 o'clock or "couvre-feu" bell, and in the parish of Bromyard a curfew bell still rings every evening, for 15 minutes, at eight p.m., from November 6th to Christmas Day, the 6th bell then tolling the date of the month. At Presteign, in Radnorshire, though in the Diocese of Hereford, and barely across the border, one John Beddoes, in 1565, conveyed premises to feoffees in trust out of the rents, to find an able person to ring a bell in the Parish Church of Presteign every morning for ever, between the Feasts of All Saints and the purification of our Lady, for one half hour, to be called the day bell; and also nightly for ever to ring one other peal with the same bell at 8 o'clock in the afternoon, as well in summer as in winter time, by the space of one half hour, to be called Curfew; and the testator provided moreover that, should should this ringing be discontinued for one year (unless for the plague or other reasonable cause), the said premises shall revert to his heirs. In Mrs. Dent's charming "Annals of Winchcombe and Sudeley," published this summer by Mr. John Murray, we find that the Curfew Bell at Winchcombe (Gloucestershire), is rung for ten minutes every night from the time of the Autumn Stow Fair until the May Fair in the same place. Here, too, the peal ends with the deliberate tolling of the day of the month. In many other parishes (*e.g.* Leominster and Kington) this custom has been kept up within living memory, and akin to it, we make no doubt, is the custom of the bell ringing at 8 o'clock at night, which one John Carey left a provision of 10s. per year, to be paid through the mayor and commonalty, to the clerk or sexton of Woodstock; to be rung nightly for the guide and direction of travellers. I mention this because I believe the parish of Aymestry has (or had) its night bell for the same purpose, and its legend of wanderers guided by it to the village's hospitable shelter. A charity somwhat akin to these is that which appears to have existed at Thruxton, Herefordshire, where an acre of land, called the "Bell-acre," was left towards the buying of bell-ropes annually, and there is a "Bell-close" for the same purpose in the charity lands of Pembridge, in this county also. Apropos of bells, Price in his Leominster Guide (p. 127), published 1808, tells us that on Shrove Tuesday in that town a bell used to ring at noon as a signal for the people to begin frying their pancakes; and if we go just a yard or so into Salop over Ludford Bridge, we might any morning hear the workmen's bell at six in the morning, provided of old by charitable forethought, to call the labourer betimes for his day's work. In connection with Ludlow, it would be wrong to omit the mention of an old Shrove-Tuesday custom, which has only fallen into disuse within the last 40 years. I mean the rope-pulling. It was the custom for the Mayor and Corporation every Shrove-Tuesday, to provide a rope three inches in thickness and 36 yards in length, and to give it out from one of the windows of the market-place as the clock struck four, when a large body of the inhabitants, divided into two parties, according to the wards or streets of the borough, commenced a vehement struggle to force

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the rope towards their respective goals. The meed of victory and the cessation of pulling took place as soon as one or other party succeeded in pulling the rope beyond its prescribed limits. This arduous and frequently dangerous contest I myself have several times witnessed as a boy, from the windows of the building whence the rope was thrown. To the best of my recollection, it had been wholly discontinued before I went to live at Ludlow in 1852 as a man. No explanation of the custom has, so far as I am aware, ever been authoritatively given, though it seems to be symbolical of some famous faction fight, or struggle betwixt two contending parties in time past. It used to be said that the Corporation knew the inner meaning of the custom. If they did, they kept it to themselves in a spirit of profoundest wisdom, or that which passed for it, mystery. Perhaps the corporative wisdom shone brightest when it decided on abolishing a custom fraught with little less than rough horse-play, a good deal of beer-swilling, many bloody noses, and not seldom a broken limb! It would be possible, doubtless, to add largely to the list of the above customs, which does not pretend to be anything approaching to exhaustion; but as I scruple to tax too heavily the patience of my hearers, I will only now add a notice of one other singular and superstitious custom which (we have it on the authority of John Aubrey) formerly existed in this county, and which numerous writers on Herefordshire matters have unhesitatingly received and adopted, although it seems that modern Welshmen repudiate Aubrey's affirmation that it could ever have been practised among themselves or their ancestors on that side the border. I mean the superstitious custom of the sin-eater, a sort of social and human scape-goat, whose office is thus described in "Brand's Popular Antiquities, from the Lansdowne MSS. in the British Museum, the particular MS. being "Remains of Gentilisme and Judaisme," by John Aubrey, R.S.S. "In the county of Hereford," it runs, "was an old custom at funerals to hire poor people who were to take upon them the sins of the party deceased. One of them (he was a long, lean, ugly, lamentable, poor rascal), I remember, lived in a cottage on Ross highway. The manner was, that when the corpse was brought out of the house and laid on the bier, a loaf of bread was brought out and delivered to the sin-eater over the corpse, as also a mazard bowl of maple, full of beer (which he was to drink up) and sixpence in money, in consideration whereof he took upon him *ipso facto* the sins of the defunct, and freed him or her from walking after they were dead. This custom alludes, methinks, something to the scape-goat in the Levitical law, and, though rarely used in our own days, yet by some persons was observed even in the strictest time of the Presbyterian Government, as at Dinedor (*nolens volens* the parson of the parish)—so that if the rector pleads ignorance we shall know the reason. The kindred of a woman deceased had this ceremony punctually performed, according to her will, and, also, the like was done in the city of Hereford in those times, where a woman kept many years before her, a mazard bowl for the sin-eater." I may notice that the above extract may be seen without going to the British Museum, by reference to p. 160 of the late Mr. Richard Johnson's well known and able volume on the "Ancient Customs of the City of Hereford." In the section devoted to this curious subject in Bohn's edition of "Brand's Antiquities" (vol. 2, p. 247), an extract is quoted from "Leland's Collectanea," which

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attributes the same custom to those "villages of Wales adjoining Shropshire;" and Aubrey is cited in the text or notes as having observed the custom in Brecon; at Llangorse, about 1640, in North Wales, where milk was substituted for beer; and as believing it to have been used heretofore all over Wales. Now, Aubrey, no doubt, was a rather credulous antiquary, though, perhaps, not more so than many others of his time. He was a frequent traveller in South Wales, inherited property in the county of Hereford, and came of a family located in Brecon and Glamorgan. Some of my hearers may remember a controversy in the *Academy* weekly paper, in 1875, respecting this question of the "sin-eater," arising out of the mention of it as having prevailed in Wales, by the writer of a paper on "Welsh Legends and Folklore," in *Blackwood's Magazine*. Certain zealous Welshmen repudiated the superstition for their countrymen, who they averred were not given to superstition, as a nationality, and who relied on the fact that no Welsh equivalent for the name "sin-eater" is extant, and that no inquiry has elicited modern evidence of the usage. On the other hand, it was shown that in 1852, at the Cambrian Archæological Meeting, held at Ludlow, Mr. Matthew Moggridge stated that the custom had been practised within a then recent period, at, or near Llandebie, in Carmarthenshire; and this agrees with the independent statement of the author of "Murray's Handbook to South Wales" (1st edition), which connects it with the secluded Vale of Cwm Amman, in the same county and district. Also, a novel of a singular character, the "Mountain Decameron," published by Bentley, and written in 1836, by Joseph Downes, gives, in vol. 3, p. 233—as from the lips of a gentleman living before this superstition became obsolete—a brief account of the last "sin-eater in Wales," whom he locates on the Cardiganshire side of the Dovey estuary. My observations of the controversy, at the time, led me to the opinion that the Welsh champions would have been quite content to allow that there had been "sin-eaters" in Herefordshire, if they could purge Wales of what seemed to them such a degrading superstition; and so it is unnecessary to say more on that part of the subject, except that the contiguity of Herefordshire to South Wales, the evidence of the Welsh occupation of the English side of the border, and the very frequent occurrence in this county of Welsh names of Herefordshire places and parishes, are arguments that a custom observed in Herefordshire would be familiar in Wales, and *vice versâ*. I hope no Herefordshire hearer will take offence at my having raked up a superstitious custom, which assuredly has now quite vanished from out our better-educated parishes, but of which I can see no reason to doubt the former existence, inasmuch as, besides Aubrey's direct testimony, accepted and quoted by several writers on Herefordshire and border customs, there are parallels to this superstition to be found in other parts of the world, as, for instance (to cite *Notes and Queries*, 5th series, vol. viii., p. 14) among the Mussulmans of Khokand, who, according to Mr. Schuyler's Book on Turkistan, "account sin-eating as a regular part of their religious observances." I would add that accessories of the plenary custom are to be found in use still, amongst the lower classes. Most of us have noticed the plate of salt placed on the breast of a corpse when laid out; and Pennant, in his Welsh tour (vol ii., 338), sketches a funeral custom of his day, containing a pretty

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faithful account of Aubrey's custom, minus what I admit is its most dubious point, the central figure, the chief actor. "Previous to a funeral," he writes, "it was customary when the corpse was brought to the house and laid upon the bier, for the next of kin, be it widow, mother, sister or daughter (for it must be a female), to give over the coffin white loaves in a great dish, and sometimes a cheese with a piece of money stuck in it, to certain poor persons; after which, they present in the same manner a cup of drink, and require the persons to drink a little of it immediately." It will be observed that here then is no human scapegoat, who, according to Aubrey, took for a consideration the sins of the defunct upon him, and thus being looked upon as a social pariah, for whom nothing was too bad, disappeared, as quickly as was possible, amidst the kicks, cuffs, and blows of the lookers on, into the outer wilderness, from which he would only emerge again on a similar occasion. In concluding my paper with a notice of this singular custom, I trust that I shall not have introduced a dismal element in this meeting, or evinced any desire to return to what I for one believe to have been a custom of our forefathers, happily now out of date and obsolete.

MR. RANKIN'S PAPER.

"THE DIFFICULTIES OF ESTIMATING GEOLOGICAL TIME."

In the following paper or essay upon the difficulties of estimating Geological periods of time, I am well aware that to most of my hearers no new facts will be given, and perhaps no new ideas; but it is possible that there may be some present who have not given this subject so much thought and attention as it deserves, and whose minds therefore may be open to receive new impressions respecting it; and it is with the hope of causing thoughtful students of this branch of science to pause, and consider the great difficulties of laying down any absolute rules or dogmatic precepts upon this subject, that I have been chiefly induced to attempt this short paper. At the very outset I feel bound to say that I know that this paper will be a disappointing one, for I fear that I shall only be able to show you the uncertainty of any of our present methods of estimating time, without, as an equivalent, being able to suggest to you any better methods. And, first of all, let us for a few moments enquire what light is thrown upon this subject by astronomical facts and theories. It is now, I believe, pretty generally admitted by astronomers, that this earth, along with other members of our solar system and the other heavenly bodies, had a nebulous origin, and that this planet on which we now dwell has arrived at its present condition by processes of contraction, accretion, and cooling down. It is also probable that before this earth assumed any solid or semi-solid form, the processes of contraction and accretion were far more rapid than they have been since, but when we ask astronomers to give us some idea of the period of time occupied by our earth while it was assuming something of its present configuration, and long before it became an orb

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capable of sustaining life of any kind at all resembling what we now find upon it, all the reply we can obtain is, that the period would be so enormous that any definite answer would be mere guesswork, and that it is a period which can only be spoken of by hundreds of millions of years. If then, such is the estimate of the period of formation of this earth when, as I have said, we are led to believe the processes of nature were far more rapid, what shall we say of the period of time which has elapsed since the formation of the earth, and during which it has been passing through those changes which are termed its geological development? To answer this question definitely, I fear that astronomy will help us as little as before, but it does teach us to recognise the vastness of the period through which our earth has passed, and the impossibility of dogmatically laying down any even approximate time for its existence, and it also teaches us that, although vast and immeasurable as the time may have been, to our ideas at least, of the growth and existence of the planets, and of the yet unexhausted time which they have to endure; yet, almost to a certainty, this earth, with the other members of the solar system, had their birth, and will have their destruction in time; and, that viewed in relation to the other systems found in the heavens, our system only occupies a mere speck in space, and only a moment in time. Leaving, therefore, astronomy as an insufficient guide to us in this research, let us come now to the consideration of what at first sight appear to be somewhat safe and trustworthy guides in estimating geological periods, namely, to the consideration of the processes of deposition of sedimentary rocks, and of denudation of earth's surface. These processes, when they can be accurately observed, do, no doubt, give us some of the best means of estimating geological time; as, when it has been determined by observation that a certain amount of deposition of mud or sand is being laid over any particular surface, such as the delta of any large river, in a given time, it can be inferred, by measuring the depth of that deposit, how long a period of time it has taken to make that deposit; and hence, how long a period of time similar conditions of land and water to those now existing have obtained. For instance, we may take one of the best known, and perhaps the simplest, examples of such deposition—the river Nile—and see what sort of inference can be drawn from its operations. It has been observed that the Nile, by its annual overflow, deposits every century about three-and-a-half inches of mud, and it has also been found that that mud deposit at Memphis extends to a depth of forty feet; and, therefore, if we take for granted that the action of the river has been uniform, we draw the inference that the Nile mud has been about 13,700 years in the process of formation. Similar observations can be made, and similar conclusions can be arrived at, by taking any of the other great rivers, but for our short paper one example must suffice. It must be now my part to try and show how very uncertain are our premises in such cases of deposition, and, therefore, how uncertain and untrustworthy must be our conclusions. And first I must draw your attention to some interesting and important facts connected with the powers of running water. We learn from the researches of Mr. W. Hopkins that "the power of water to move bodies that are in it, increases as the sixth power of the velocity of the current." That is, if we double the velo-

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city of the current, the motive power is increased 64 times (2^6); if we treble the velocity, the motive power is increased 729 times (3^6) and so on. From this it can easily be seen how immense a change in the character of the deposit of any rock can be made by a comparatively small amount of increase, or decrease, in the velocity of the current or river which is forming the deposit. Again it is found that water moving at the rate of three inches in a second, tears up fine clay, six inches in a second tears up fine sand, 12 inches in a second tears up small pebbles, 36 inches in a second large gravel. Bearing these facts in mind, let us, for a moment, consider a few of the known causes which may arise to alter the velocity of a great river. And first and foremost would come, any, even the smallest, alteration in the level of its bed; if by the action of volcanic force, the hills or table land through which any river flowed were either elevated or depressed, the result would be either the great increase or great decrease in the velocity of the river, and consequently the entire change in the relative position of its deposits. Again, when two rivers meet in their courses, the result is not so much the widening of the bed, as the increase of the velocity of their current; here again we must note a frequent cause for a complete change in the nature of a river's deposit. Again, another important cause of the velocity of any river is the rainfall in the country where it has its origin—that is, in years of great rainfall the river will be much more rapid than in years of small rainfall, and in the former case would bring down and deposit a much greater quantity of material than in the latter case, and the deposit in after ages when viewed by geologists might erroneously be supposed to be the work of either a much too great or a much too short a time. And now, recalling to mind the laws of moving waters, and the causes which I have briefly touched upon which may operate to cause an alteration of velocity or volume in any stream or river, let us apply them to the example which I proposed—namely, the Nile—and see how our supposed conclusion as to the length of time required to form the Nile mud deposit may be effected. And first, taking the case of the deposit of sand and mud formed by the overflowing of the waters of the Nile, it can easily be understood how, if under one of our supposed causes, when the rainfall over the uplands where the river has its origin was much less than at present, the overflow of the river would be much less, and its deposit of mud would be much less, and also it is quite possible—indeed probable—that the action of the river as regards deposition might be intermittent. Here, then, we can at once recognise a possible source of error in any conclusions which we might have come to as to the time of the formation of the Nile mud. Again, let us suppose that from one or another of the causes which I have mentioned the river in former times had a greater velocity than at present, and that its action had been brought to bear upon the area of deposit we are supposed to be investigating, we should then find that by the greater moving powers of the water, the fine mud which might have been already deposited would have been torn up and borne away out to sea, and if the action of the river was either considerably increased for a short time or slightly increased for a long period, hundreds or thousands of years of former deposits might be swept away. In this case, therefore,

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we can see a cause for a break in this continuity of our deposit which might easily introduce an error of hundreds of thousands of years. I may here mention that the case of the Nile is rather an exceptional one, as few rivers are at present known to overflow their banks and yield a deposit of mud with the same regularity as it does, and therefore of course the reasoning which applies to the Nile would apply with much greater force to most other rivers. Let us now take a brief glance at the delta of a river, which is where the chief soil forming operations go on. Here we have a very fair means of judging by observing the character of the deposit, whether the river has been at various times a swift or a sluggish one, as a swift river will deposit stones and pebbles on its delta, as for instance the Rhone, and a sluggish river sand and mud, as for instance the Thames, but we have no means of testing how much the river during its periods of greater velocity may have interfered with its action during its periods of lesser velocity, and hence any deductions as to length of time required to produce what we now find in any particular deposit would be exceedingly inaccurate.

Another important source of disturbance in any calculations as to geological time arises from the alteration of the course of ocean currents. This alteration may arise from various causes, but one of the most important of such causes is the opening up of a new strait or channel between two seas, which would immediately give rise to a current if there was any difference between the temperatures of the two seas, such as for instance between the Mediterranean and Red Sea. Now, suppose a new ocean current to arise from some cause or other, and to sweep past the mouth of a large river where a delta had been forming for thousands of years, the effect would be, that if the ocean current were at all a powerful one, the portion of the delta still under water would be rapidly swept away, and in future geological time leave no trace of its existence, and hence no data to tell us of the immense period during which it was in process of formation.

Once again, another process of rock formation which can be observed in the present day is that of coral reefs. Now, it can be discovered by observation what is the amount of work done by these little coral polyps during certain periods, and therefore some kind of rough deductions can be made as to the length of time required to build up a certain thickness of such coral rock; but here also we must be prepared to recognise as a most important possible source of error in any of our calculations as to time, the fact of upheaval and subsidence, which processes are all but universal in coral forming districts. The coral insect or polyp cannot work either out of the water, or in water more than 90 fathoms deep, and therefore when a coral reef formed on any sunken island or rock subsides beneath that depth the formation of coral ceases, and this may be the case during immense periods of time, and again when upheaval takes place the coral polyps would again begin their work as soon as they found the rock in a suitable depth of water. In after geological ages, when this rock was observed, no record would be found of the period of time during which a cessation of work had occurred. Here, again, we are obliged to acknowledge how uncertain and unreliable are any conclusions as to geological time which we may come to.

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I will only touch upon one other instance of the irregularity of deposition such as might occur in Lacustrine formation. Suppose, for example, a chain of lakes in some mountainous district connected together by a river flowing in at the one end and out at the other. During countless ages this river or stream may have been bringing down a regular deposit of sand, gravel, or stones from one of the upper lakes to one of the lower; but suppose from some of the many causes which affect the levels of the surface of our earth, an unusual flood should occur and the barrier of one of the lakes be swept away: the result would be that a great portion of the water of the lake would be, in a very brief period of time, precipitated down the valley into the next lake, and, bearing in mind the enormously increased power of water in rapid motion, it is easy to understand how such a catastrophe would in a few hours destroy the quiet work of deposition which might have been going on for ages, and replace it by a vast deposit of heavier materials. In this case—which is a very common one—the record of ages may be swept away in a few hours.

In a short paper like the present it will not do to spend too much time over any one particular branch of the subject, so I must now pass on to consider how our estimate of geological time may be affected by the work of denudation. Denudation, as no doubt all who hear me are aware, is the opposite process to deposition, and is the wearing away either by the action of the atmosphere, or water, or ice, of some portion of the earth's surface. This action may be said to be going on more or less all over the portion of this earth which is above the sea level; but I need hardly point out how much greater are the visible effects of denudation by the sea coasts, and by the banks of rivers and glaciers—which latter may be compared to frozen rivers. Now, to turn to our particular subject of measuring the time of geological action, it has constantly been observed that at certain parts of the coast the land is gradually receding, and upon some measured data of this kind, conclusions are drawn as to the length of time that the sea has been making such a channel, or the length of time which will be required to remove the coast so much farther inland, and so forth; and no doubt these conclusions are logical just so far as we are able to trust the premises. In many cases the action of the sea appears to be very regular, and in these cases our inferences are, no doubt, correct,—or nearly so—but there are a far more numerous class of cases where, on account of inequality of hardness of rock, the action of the sea upon the coast is very irregular. This, of course, is one of the chief causes of the indentations of the coast line into bays and capes. Here, then, it is evident that the action of the sea upon a soft and yielding rock is very much greater than upon a hard one; and as, when once the rock is removed, we have no evidence left of what sort of rock it was—and hence no evidence of the time it took in its removal—it is palpable that no trustworthy conclusions can be based upon any action we see going on, unless we can also satisfy ourselves that the rocks have all been of the same kind, which, without any direct positive evidence, it is very difficult to believe. The process of excavation by water is well seen in the case of some of the great rivers of the world, but in no instance that I know of is there a better

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example of this than in the case of the Niagara river. Here a deep channel has evidently been cut out by the water constantly falling over the rocks, for a distance of about seven miles, that is, from Lake Ontario to the present Falls. Sir Charles Lyell states that after careful inquiries and observation on the spot, he came to the conclusion that the Falls probably were receding at the rate of about one foot a year, and he remarks that if this rate was uniform it would have taken the river more than 37,000 years to have cut its way back from the cliffs on Lake Ontario to the present position of the Falls. But for the rate of denudation to be uniform, it would be necessary not only that the velocity of the river remained constant, but it also requires the rocks over which the Falls have descended to be of uniform hardness throughout. Now, this is a very improbable supposition, and one which is rarely found to hold true for any great length of rock; and in the particular case of the ravine cut out by the Niagara river it certainly is not the case. The uppermost rock over which the Falls now descend is a hard limestone of the Silurian period, and underneath it is a soft shale which would be quickly worn away compared to the hard limestone; and there is evidence that about four miles from the present Falls at some remote period a barrier of very hard rock must have existed which retarded the action of the Falls for ages, and allowed of the fluviatile deposit now found there to accumulate. This single instance must suffice to show the necessarily unsatisfactory nature of the evidence afforded as to time even by the most favourable case, and I must now hasten on to make a few remarks upon glaciers. Glaciers, like rivers, wear away and carry off quantities of material from the rocks through which they pass, and in cases where the glacier melts and runs into the sea during the summer, to some extent this material is often borne to a great distance; but in all glaciers, to a greater or less extent, there is at their termination what is called a terminal morraine, consisting of fragments of rock and *débris* of all kinds brought down by the glaciers. Now, it can, to some extent, be ascertained what amount of accumulation is annually deposited by a glacier at its terminal morraine, and therefore by measuring the length and depth of the morraine, some notion of the time during which the glacier may have existed in its present form may be obtained. So far, this method of estimating geological time is perhaps fairly satisfactory, but it must be remembered that any subsidence of the earth's surface at that place where the glacier is, would raise the temperature and would probably destroy the glacier, as would likewise a rise of temperature from any other cause, and its depositing action would for the time cease, to be resumed again upon a subsequent elevation of level or depression of temperature. It is somewhat beyond the scope of this paper to enter into any discussion as to the causes of glacial periods, but it may not be quite out of place if I point out that there are two chief causes for glacial periods, one of which will account for a general or universal glacial epoch over the higher latitudes of one hemisphere, and the other for local and isolated glacial periods, and it is very necessary that geologists should carefully distinguish between these two causes of a glacial action. The one cause for a general glacial epoch in the northern hemisphere may be found in astronomical considerations connected with the eccentricity of the earth's orbit,

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and when the earth is in aphelion during our northern winter. When the earth's orbit is at a period of great eccentricity, which astronomers tell us it was from about 80,000 years ago to 300,000 years ago, and when our northern winter occurs when the earth is in aphelion, or furthest from the sun during that period of great eccentricity of orbit, it is manifest we have a cause in the greater distance of the earth from the sun to account for a considerable depression of temperature during the winter. At present the reverse of the above state of things prevails, for this is not a period of great eccentricity of the earth's orbit, and our winter occurs during perihelion, and not during aphelion, and, therefore, in our northern hemisphere the winters are milder and the summers cooler than in the opposite state of things. The difference of temperature between that of our present winters and that of the winters in the foregoing suppositious case can be calculated approximately, as the distance of the earth from the sun in winter is now about 90 millions of miles, and in the case of greatest eccentricity of orbit would be 97 millions of miles, or, in other words, our earth is 7 millions of miles nearer the sun during our present winters than it was 210,000 years ago. Now, it has been estimated that absolute zero, or the temperature of this earth without any sun at all, would be 490° below the zero upon Fahr. thermometers, and as our winter temperature is called 39°, it follows that our temperature above the real zero is 529°, and as the heat of the sun varies inversely as the square of the sun's distance from our earth, it follows that when the earth was seven millions of miles further off than at present, the temperature of the winter would be 456° or 73° lower than at present; or, in other words, 34° below our present so-called zero, a temperature quite sufficient to account for a glacial period. Also, during that long time of great eccentricity of orbit of 220,000 years, it must be remembered that about ten periods would occur when the earth was in aphelion during the northern winter, as the aphelion revolves relatively to the equinoxes in 21,000 years. The other cause for a local glacial period is to be found in the elevation of a certain area of country. This elevation may be due to some internal volcanic causes, and of course the result of such elevation would be a diminution of temperature. This cause of glacial action is probably a very common one, and may occur all over the world, as it is now actually happening in Switzerland and in the Himalayas. It is almost impossible to assign any exact date to the length of time such glacial period may have lasted; but from observation as to the rocks displaced in some cases, an idea of when the disturbance began may be formed. This consideration of how temperature and climate may be, over some distinct area, affected by elevation, should always be well weighed by geologists as a possible solution of the cause of Arctic forms of life being found in tropical and sub-tropical regions, and too hasty conclusions as to the entire change of climate over the whole world should thus be avoided. While upon the subject of the earth's temperature, I will briefly notice a class of observations, which, in some measure, if we can depend upon the universality of the observations, seem to offer some answer as to the length of time as to which life has been capable of existing upon this planet. I refer to the observations upon the earth's temperature below the surface. It has always been found wherever experiments of the kind have been made, that the temperature of the earth's

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crust increases as we descend, and, upon the whole, the rate of increase is very uniform, it being somewhat more rapid in cold regions, and less so in hot ones, which is what might have been expected. Upon the average, the increase is about 1 deg. Fahr. for every 50 feet of descent into the earth. This result must be stated subject to the reservation that any depth yet explored by man is very trifling when compared to the thickness of the earth's crust, and also that some of these experiments at great depths were very unsatisfactory, owing to the borings containing water, in which, by the virtue of the law of equilibrium of fluids, currents were produced which carried the warmer and lighter water to the top, and the heavier and colder water to the bottom, thus interfering with the accuracy of the experiment by making the top strata too warm and the bottom strata too cool. This has taken place to such an extent on some occasions, as to lead some observers to conclude that after a certain depth, no increase of temperature took place at all, and that the source of heat in the crust of the earth was in itself, and due to chemical changes, and not due to some central internal heat, such as the advocates of the theory of a constant increase of temperature are bound to believe in. However, to bring these remarks to bear upon our subject of geological time; Professor Thomson has calculated that this rate of increase of temperature has diminished from 1 deg. for every 10 feet of descent, to 1 deg. in every 50 feet, as at present, during the last 96 millions of years, and he says that if this process has been going on with anything like uniformity for 200 millions of years, the amount of heat lost in that time would be sufficient to melt the rocks forming the earth's crust, and that, therefore, it is improbable that life has existed upon this earth for more than 100 millions of years. But here I must once more point out that these calculations, interesting as they are, are only based upon assumptions which are not fully proved, and that a very slight error of observation would create a very great error in the calculations, and, at best, the results arrived at are vague and undetermined.

I must now take a brief glance at what may, by some geologists be considered as the surest and best guide for measuring geological time, namely, organic remains. It has been established in palæontology that some forms of life had their origin before others, and the rocks in which certain forms of animal remains, such, for example, as Trilobites are found, are supposed to be of more ancient date than those which contain, say, the Nummulites, and indeed it is chiefly upon the animal remains found in the different rocks, that these rocks have been separated into epochs, periods, strata, and so forth. But without in the least, wishing to depreciate this method of geological reasoning, or to deny its truth, as far as the order of superposition of rocks is concerned, I must point out in two or three ways, how difficult it is to derive from its source any information which can really be looked upon as reliable, as to the duration of time which any particular rocks took in being formed. And first we must be convinced of this fact in biology, that the changes in the animal and vegetable kingdoms are chiefly due to the alteration of the circumstances surrounding them, and if the circumstances remain the same, the species of animals and plants will continue the same

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also, for almost any number of years; but if, from any of the innumerable causes which affect the conditions of life, some change is made in the surroundings of any class of plants or animals, that class of plants or animals is sure, before very long, either to die out altogether, or to alter materially, so as to adjust themselves to the new conditions. Now from these remarks it will easily be seen that, owing to some regions of the earth having been much more disturbed and altered in their physical character than others, the animals and plants which have lived upon the disturbed regions will also show a much greater variety of type and form than those which have lived upon a quiet and undisturbed region; and hence, looking back through the strata of rocks, a great succession and variety of forms in the rocks of some countries, and a great uniformity of form in the rocks of other countries, and the forms of animal life found in the upper strata of some regions may be somewhat similar to those found in the lower strata of other regions, and from these appearances it might be argued, and, indeed, frequently has been so argued, that these two sets of rocks have been formed at very different periods of the world's history, the truth being, that in one set of rocks frequent changes of animal and plant species were going on, while in other rocks, undisturbed by changes, the same species lived and died from century to century, and that as a matter of fact, the two sets of rocks were being formed contemporaneously. It must, therefore, be clear, from the foregoing remarks, that it is exceedingly difficult to pronounce upon the age of any rocks upon the authority of their animal or vegetable remains. It is not the object of this paper to go into details, but I may just mention, by way of example of the foregoing remarks, that if we take a belt of the earth's surface, from, say, latitude 55° N. and longitude 10° W., and about 20° in width, to latitude 5° S, and longitude 150° E., we will pass over an area of great commotion and disturbance, and we will find a corresponding amount of change in the animal and vegetable inhabitants of these regions, and if we take a broad belt south of the other, we will pass over a large tract of land where nature seems to have been, for untold ages, going forward in a quiet and unmolested routine, and here we find but slight changes in the animal and vegetable remains. The first-mentioned belt would take in England and Wales, Europe, south of the Alps and Balkans, and down to the shores of Africa, Asia Minor, Persia, North of India and the Himalayas, Malay and the Malay Archipelago; and the second belt would embrace Central and North Africa, Southern India, and Australia. I may just point out that all civilisation had its origin within the first-named belt of country. From these few remarks upon the causes of change in animal and plant life, it will be seen how very possible it is for whole generations of animal or vegetable forms to pass away and become extinct in one region of the earth, while during the same period, in another, the same old forms continue to live and flourish, and, therefore, we must be very cautious, indeed, as to how far we lay down the law as to any measurement of time based upon the number of species which may be somewhere found as fossils.

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Woolhope Naturalists' Field Club.

ANNUAL MEETING.

THE Members of the Woolhope Naturalists' Field Club held their last meeting at Hereford on Thursday, October 4th, 1877. The majority of the following members and delegated mycologists started in four carriages from the Free Library, at 10 o'clock, for Whitfield (by the kind permission of the Rev. Archer Clive), for a foray among the funguses :—

Mr. J. Griffith Morris (president), Dr. Chapman (vice-president), Rev. J. E. Vize, Rev. C. H. Bulmer, Rev. W. C. Fowle, Rev. G. M. Metcalfe, Rev. R. H. Cobbold, Rev. James Davies, Rev. S. Thackwell, Rev. T. Beavan, Rev. H. B. D. Marshall, Rev. E. Cunningham, Rev. A. Temperley, Rev. Augustine Ley, Rev. H. W. Tweed, Rev. F. H. Tatham, Rev. J. E. Jones, Rev. W. J. Thomas, Rev. James Brown, Mr. Thomas Cam, Mr. Wm. Phillips, Mr. C. B. Plowright, Mr. C. E. Broome, Dr. M. C. Cooke, Mr. Edwin Lees, F.L.S., &c., Mr. G. Worthington Smith, Mr. James Renny, London ; Dr. Hogg, Mr. R. M. Lingwood, Dr. Bull, Mr. Elmes Steele, Mr. Theos. J. Salwey, Mr. J. H. Wood, Mr. Arthur Thompson, Mr. J. A. Bradney, Mr. W. A. Swinburne, Mr. Theos. Lane, Mr. James W. Lloyd, Mons. J. de Seynes, Mons. Henri de Seynes, Mons. Maxime Cornu, Mr. du Port, Miss du Port, Dr. Bennett (of the University of New South Wales), Mrs. Bennett, Mr. T. Howse, London ; Mr. A. S. Bicknell, Mrs. Bicknell, Mr. Percy Bicknell, Onslow-gardens, London ; Miss Ellis, Mr. H. P. Bull, Mr. Cecil H. Spencer Percival, Bath ; Mr. Charles Fortey, Mrs. Chapman, Lancaster-gate, London ; Mr. J. C. Kent, Mr. W. F. Marsh Phillips, Mr. James Davies, Mr. H. Southall, Mr. H. Hall, Mr. J. F. Symonds, Mr. H. C. Moore, Mr. Jos. Carless, jun., Mr. F. R. Kempson, Mr. J. E. Norris, Mr. Thomas Llanwarne, Mr. J. Reginald Symonds, Mr. William Jay, Mr. Watkins, Mr. D. R. Chapman, Mr. Wheatley, Whitfield ; Mr. Ward, Stoke Edith.

On the return of the members from Whitfield about 3.30, they formed themselves into a meeting for the transaction of the following business, the election of officers for 1878, who do not take office until after the annual meeting in the spring.

There were present—The President elect, Rev. H. W. Phillott, Staunton-on-Wye, Hereford ; Vice-President, Mr. J. Griffith Morris, St. Owen Street, Hereford ; Rev. R. H. Cobbold, The Rectory, Ross ; George Cocking, Esq., Ludlow ; Mr. Henry Southall, Ashfield, Ross.

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The following were all re-elected to their offices:—Central Committee: Mr. Timothy Curley, Broomy Hill, Hereford; Mr. C. G. Martin, Broad Street, Hereford; Mr. Orlando Shellard, Barton Manor House, Hereford. Editorial Committee: Rev. H. W. Phillott, Staunton-on-Wye, Hereford; Dr. Chapman, Burghill; Rev. C. J. Robinson; Rev. James Davies, Moor Court, Kington; Rev. Sir G. H. Cornewall, Bart., Moccas Court, Hereford; Rev. H. Cooper Key, Stretton Rectory, Hereford; Mr. James Rankin, Bryngwyn, Hereford; Dr. McCullough, Larchfield, Abergavenny: Treasurer, Mr. Thomas Cam, St. Owen's Street, Hereford: Secretary, Mr. Arthur Thompson, 12, St. Nicholas Street, Hereford: Auditors, Mr. James Davies, Wood View, Hereford; Mr. J. T. Owen Fowler, St. John's Street, Hereford.

After the above meeting the members and their friends, to the number of seventy-five, adjourned to the Green Dragon Hotel to dinner, after which, and during the evening several interesting papers were read.

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EXHIBITION OF APPLES AND PEARS.

THE exhibition of apples and pears in connection with the Club was held in the Museum and Woolhope Room of the Free Library, on Thursday, October 11th, when about 1200 plates of fruit were exhibited. This is a very gratifying fact, and shows what growing interest the public take in such matters, especially when the very unpropitious character of the season is taken into consideration. This remark especially holds good about pears, the collection of which, as might have been expected, was rather limited; however, a magnificent collection of the finest grown French and English pears was sent by Sir H. Scudamore Stanhope, from the Holme Lacy Gardens, grown on the celebrated Cordon Wall, which certainly seems to set at defiance all the enemies that pears are heirs to. The following is a list of exhibitors:—Mr. F. Bodenham, 15 plates of pears; Dr. Bull, Hereford, 7 plates of apples; Rev. F. Cunningham, Nottinghamshire, 42 plates of apples and 2 plates of pears; Rev. A. Ley, Sellack, 10 plates of apples; Mr. B. Cock, 1 plate of apples; Mr. Brown, Lewstone, Mon., 12 plates of apples; Mr. Ford, Withington, 3 plates of apples; Dr. Jones, Langstone Court, 2 plates of apples; Mr. J. Cleave, Hereford, 2 plates of apples; Mr. J. F. Symonds, Broomy Hill, 5 plates of apples; Rev. T. Shackleton, Hereford, 3 plates of apples; Mr. Bradney, Sutton, 23 plates of apples; Mr. Bennett, 33 plates of apples; Mr. Boyce, Leominster, 3 plates of apples; Mr. Bray, Naven, Dilwyn, 8 plates of apples; Mr. W. Lewis, Dilwyn, 10 plates of apples; Mr. A. C. de Boinville, Dilwyn, 7 plates of apples; Mr. Lacon Lambe, Dilwyn, 8 plates of apples and 3 plates of pears; Mr. C. H. Spencer Percival, 1 plate of apples; Dr. Bull, Hereford, 6 plates of apples and 2 plates of pears; Mr. Galliers, Norton Canon, 3 plates of pears; Rev. Jas. Davies, Moor Court, 4 plates of pears and 18 plates of apples; Captain Doughty, Hampton Park, 15 plates of apples and 2 plates of pears; Mr. C. Watkins, Wisteston, 80 plates of apples; Mr. J. Griffith Morris, 1 plate of apples; Mr. R. H. Ballard, Ledbury, 10 plates of apples; Mr. Hall, Dormington, 49 plates of apples; Mr. Pitt, Bosbury, 72 plates of apples; Mr. H. M. Edwards, Broadward, Leominster, 7 plates of apples; Alderman Carless, Hereford, 4 plates of apples; Mr. W. H. Apperley, Withington, 6 plates of apples; Rev. H. Tweed, Bridstow, 15 plates of apples; Mr. J. Evans, Kenchester, 1 plate of apples; Mr. J. Jones, Shelwick, 1 plate of apples; Mr. Hyde, Bodenham, 2 plates of apples; Mr. H. Higgins, Thinghill, 7 plates of apples; Mr. J. Yeomans Cooke, Moreton House, 7 plates of apples; Mr. Yeomans, Canon Pyon, 19 plates of apples; Mr. W. Cale, Tarrington, 5 plates of apples; Mr. Hughes, 3 plates of apples; Mr. James Bowers, Hereford, 8 plates of apples; Mr. A. C. Swinburne, 14 plates of apples; Mr. Jay, Lyde, 31 plates of apples; Dr. John Morris, Hereford, 29 plates of apples; Miss Guthrie, The Pool, 10 plates of apples; Mr. J. G. Bull,

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10 plates of apples and 1 plate of pears; Mr. T. Cam, 1 plate of apples; Rev. E. Cunningham, 1 plate of apples; Dr. Bull, 6 plates of apples; Mr. J. G. Price, Llancillio, 1 plate of apples; Dr. Bull, 18 plates of apples; Rev. A. Clive, Whitfield, 30 plates of apples and 2 plates of pears; Mr. J. W. Lloyd, Kington, 3 plates of apples; Mr. Lacon Lambe, Dilwyn, 13 plates of apples and 5 plates of pears; Mr. H. C. Beddoe, 4 plates of apples; Messrs. Davison and Co., 13 plates of apples; C. Fortey, 4 plates of apples and 1 plate of pears; Capt. Freeman, Lugwardine, 5 plates of apples and 1 plate of pears; Rev. Jones Machen, Llanthewy Rectory, 1 plate of apples and 2 plates of pears; Mr. Stringer, Ledbury, 4 plates of apples; Mr. J. Bosley, Lyde, 11 plates of apples; Mr. Mason, of Wellington, 14 plates of apples; Mr. F. W. Herbert, Credenhill, 34 plates of apples; Mr. J. Lechmere, Fownhope, 37 plates of apples; Mrs. Edwards, 16 plates of apples; Sir George Cornewall, Moccas, 18 plates of apples; Rev. A. Ley, Sellack, 2 plates of apples; Mr. J. H. Arkwright, Hampton Court, 87 plates of apples and 26 plates of pears; Mr. Graham, Moreton, 3 plates of pears and 2 plates of apples; Mr. Hooper, Sutton, 27 plates of apples; Mr. Grove, Tupsley, 15 plates of apples and 2 plates of pears; Rev. C. H. Bulmer, Credenhill, 1 plate of apples and 10 plates of pears; Mr. Wm. Hill, Eggleton, 20 plates of apples; Mr. Jay, Lyde, 8 plates of pears; Sir H. Scudamore Stanhope, 55 plates of apples and 47 plates of pears; Sir Herbert Croft, Lugwardine, 4 plates of apples.

Among so many it would, of course, be invidious to particularise any of the collections of apples, especially so as many of them were worthy of notice; indeed, it was quite the exception not to find one or more of the interesting varieties among even the smallest of them. But the large and interesting collections of culinary, dessert, and cider fruit, sent from Mr. J. H. Arkwright, of Hampton Court, Mr. W. Jay, of Lyde, and Mr. Watkins, of Bewell Street, the collection of old Herefordshire fruits from Mr. Lechmere, of Fownhope, and the small, though exceedingly fine and choice collections of Mr. H. Higgins, of Thinghill, and the Rev. H. Tweed, of Bridstow, must not be allowed to pass without notice. It was a matter of great regret that Dr. Hogg was prevented by indisposition from classifying and naming but a few of the varieties before the exhibition was open to the public, on Thursday, but our great authority was at his post on Friday, when he left but very few unnamed amongst them. There were, of course, some very remarkable varieties left, which the learned doctor had never seen, and which, therefore, must be held to be purely local. All fruits of this description had a reserve put upon them, and will be sent to London, to him, for dissection and description, when they will no doubt be brought into the more prominent position which they deserve. In addition to these, he also reserved those varieties which will be required for description and figuring in the present and future numbers of the new *Herefordshire Pomona*, which is shortly to appear. It is a matter of some considerable regret that the exhibition was not open to the public on Wednesday, when those more particularly interested in the culture of the fruit would have been present in Hereford, but still, with all the drawbacks mentioned, the third exhibition of apples and pears, under the auspices of the Woolhope Club, must be considered a decided success.

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THE FUNGUS MEETING AT HEREFORD.

THE annual meeting of the Woolhope Club, for its "Fungus Foray," was appointed for the week beginning Monday, October 1st, and ending Saturday, October 6th, but a few members of the Society put in an appearance at Hereford as early as September 26th. No special work was done by the Club till Monday, but on the previous Thursday, Thomas Andrew Knight's "Monarch" orchard was visited, at Tillington, his birthplace at Wormsley Grange, and his grave.

HEREFORD POMOLOGY.

The visit to Wormsley was altogether a pomological excursion, the authorities being Dr. Hogg, Dr. Bull, the Rev. C. H. Bulmer, and an old man from Hereford, 80 years of age, who brought a branch of Xanthium spinosum with him, just found close to Hereford. Many of the apples now growing at Wormsley, are hybrids or seedlings, difficult, if not impossible, to name. The latter part of the Wormsley day was devoted to archæological and architectural matters, ending with lawn tennis, and an excellent dinner at the Rev. C. H. Bulmer's. The Hereford men did not leave Credenhill till after 10 p.m., and the 4 miles drive to Hereford was through a thick, white, wet fog, which, though it gave a romantic turn to the drive—it being like riding through the clouds—yet the wet air got sadly into the bronchial tubes of the fungologists, and with anything but pleasant effects. On Friday, the 28th, the pomologists visited Holme Lacy, to see the wonderful collection of pears, growing upon a south wall, and to see the portraits of Lord Scudamore and Mr. Cornewall. Good gardening was observed in the magnificent growth of the pears, of Tropæolum speciosum, Gentiana acaulis, &c.; together with bad gardening, represented by enormous quantities of diseased potatoes allowed to fall into a mass of wet decay upon the surface of the beds. Truffles were turned up from under laurels. In the afternoon, a visit was paid to Breinton, to see a famous Foxwhelp apple tree, but, owing to the badness of the season, only one apple could be found, but a mistletoe plant was observed growing upon the tree, with a whorl of three leaves instead of two. At this place a fine specimen of Polyporus hispidus was observed on an ash, but as one side of the ladder always fell off when the top was reached, neither ladder nor tree could be ascended; some mischievous person, moreover, had, a short time before, shot the Polyporus. Fungi are not included among the small birds protected by Act of Parliament. Here a small collection of apples was examined, some with peculiar names, as "Hang down," and "The Ten Commandments." On asking for an explanation of the latter, an apple was cut in two, so as to display ten bundles of vascular tissue, very strongly marked. These names were surpassed, however, by the names of others which have found their way to Hereford, as "End of the

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Walk," "Close to the Pump," "Near the Gate," &c. No proper names were known for these apples, so they took temporary names from their position in the orchard. Saturday was devoted to planting various Herefordshire apples and pears, by Miss Ellis, of Hereford, and one of the artists employed on the *Gardener's Chronicle*. Sunday was spent in a quiet and proper manner, as became the day, the only event of importance being a telegram from M. J. de Seynes, "Professeur agrégé à la Faculté de Médecin de Paris," to say he had just arrived in London, with his son, and would be at Hereford on the following day, at 12; to accomplish this he had to leave London at 6 a.m. on Monday. So much for fungological enthusiasm!

THE FUNGUS FORAY.

At last, Monday, the 1st of October, and the first day of the "foray," arrived, and with it an influx of fungus men and women and their paraphernalia. M. de Seynes, his son, and Mrs. Chapman, of London, arrived punctually at 12 —Mr. Broome, of Batheaston, being in the same train. Later in the day M. Maxime Cornu, of Paris, with Mr. Howse, of Sydenham Hill, were met at the station by Dr. Bull and the Historian of the Woolhope Club. Still later in the evening came Mr. Renny, of London, Mr. and Miss Du Port, of Norfolk, Mr and Mrs. Bicknell, of London, Mr. Cecil H. Sp. Perceval, of Henbury, the Rev. Mr. Cunningham, from Nottinghamshire, and many others. Dr. George Bennett, Member of the Medical Faculty of the University, Sydney, New South Wales, re-arranged his plans specially to attend the Hereford meeting. M. de Seynes brought with him from Central France some magnificent specimens of the orange-topped Agaricus cæsareus, the first species in Fries' *Epicrisis*, and the species which, cooked under the direction of Agrippina, poisoned Claudius. None of the Woolhopeans had seen the species before, and it was sketched on the spot. M. Max. Cornu also brought a large number of species of fungi, notably Agaricus Eryngii—a parasite upon the roots of Eryngium campestre, and never yet detected in this country. Mr. Berkeley could not come, as he was detained by an examination in London; he, however, sent a letter (enclosing two funguses) congratulating the club on the fine weather. The Rev. J. E. Vize, of Forden, the author of Æcidium depauperans, was detained for two days in Montgomeryshire, as two persons in that benighted district had the bad taste to wish to be married during the week of the "foray." Mr. Plowright, the surgeon, of King's Lynn, was detained for two days, owing to some "cramming" process, the details of which did not come to light.

Never before were there so many visitors at Hereford from long distances, and it was rumoured, on apparently good grounds, that next year would certainly witness the arrival of the Mikado of Japan, and three botanists from Yokohama, to see if they could not get some hints on fungus-growing better than their present method of producing the "Shu-take" fungus by tapping the "Shu" tree with a mallet. There would be no difficulty with the language, as Dr. Bull speaks all languages (dead and living) with equal fluency. Dr. Bull entertained the visitors from France to dinner, but during his temporary absence no one could remember

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either the French, Latin, or Greek for "Welsh Rabbit." At this and other dinners the famous Foxwhelp cider was produced; this cider is so strong, that it is hardly safe to open a bottle of it in a dining-room, for the cork rushes out with a terrific explosion. Many bottles burst in the cellars. (Mr. Andrew Knight invented a cold-water cellar to keep the extraordinary potency of this cider within limits, by flooding). It is not uncommon to see scars in ceilings from the percussion of Foxwhelp cider corks, and at one dinner a bottle was opened on the lawn for safety and experiment. In this instance the cork flew out like a rifle-bullet, struck the branch of a tree with terrific violence, and flew off at a tangent into space: it is certain the cork never came down again, and it is probable that at this moment it is sailing through the universe as one atom in the cider-ial system, and is perhaps the new asteroid recently named "Maria" by an American astronomer!

All went to bed very tired on Monday night. Nevertheless, on Tuesday morning the French visitors and a number of old Woolhopeans, including Miss Ellis, were at Dr. Bull's house before seven in the morning, to snatch a hasty breakfast before starting by the 7.30 a.m. train for Ludlow. All the fungological visitors in Hereford joined this excursion, meeting Messrs. Cooke, Phillips, Lees, &c., either at the Ludlow Station, or at the Messrs. Fortey's house. The excursionists were 23 in number. The Messrs. Fortey, with their customary liberality, had prepared an excellent (we were almost writing luxurious) breakfast for the entire party, and after a stroll through the ancient town, the botanists departed in vehicles for Downton Woods. The weather was uncommonly fine, had been uncommonly fine, and remained uncommonly fine until the end of the meeting, so that the visitors from France had no reason, in this instance, to complain of Perfidious Albion; the only little difficulty rested with one of the Ludlow horses, which proved to be a desperate kicker, and looked round at the Nottinghamshire clergyman (on the box) in a most spiteful manner. Mons. Cornu carried an immense cylindrical vasculum over his shoulder, a pocket microscope, and a dangerous-looking knife with a blade 9¼ inches in length: M. Cornu said, the same sort of knife was used for stabbing a French policeman a day or two before. M. de Seynes carried a very small vasculum in front, and an instrument half-way between a chisel and a knife, with a blade more than 1 foot long. The first fungus found, was the Vegetable "Bifteck," and Hygrophorus pratensis, growing in company with Gentiana campestris. After these, came many of the other well-known rare Herefordshire fungi, as Cortinarius sanguineus, cinnamomeus, cinnabarinus, Strobilomyces strobilaceus, Peziza onotica, Clavaria Botrytis, aurea, coralloides; Agaricus euchrous, Hygrophorus calyptræformis, &c., all large, handsome, rare, and highly-coloured species. The fungi, as regards number, were scarce, but several species, either new or of uncommon interest, were found. By the Teme side, we noticed Scrophularia Ehrharti and Iris fœtidissima. One of the Puff-balls, Lycoperdon gemmatum, was growing for a considerable distance up the mossy side of a tree, whilst various species of Hygrophorus were growing in plenty in the open spaces, with the "Eye-bright," Euphrasia officinalis—

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"Break-Spectacles" in France, said M. Cornu. The find of the day, and new to this country, was undoubtedly Agaricus Russula, a crimson-topped Agaric, looking exactly like a Russula, till the gills were examined, and then it proved to be an Agaricus "mimicing" the colour and habit of a Russula. Agaricus Russula was so named by Schæffer, but there is another (book) plant named by the illustrious Fries Hygrophorus erubescens; the description of both tally as well as natural objects (especially fungi) will tally with descriptions, and the two plants are undoubtedly the same. According to book descriptions the two things cannot be "co-generic," but those who know the Agaricus have never seen the Hygrophorus, and those who find the Hygrophorus (says M. Cornu) never meet with the Agaricus.

There are at least twice as many described species of fungi as there ought to be, especially amongst the small species; a fungus in a dry place is another species in a moist one, on a sunny day it is one thing, on a rainy day another; it may be one thing over night and quite a different species in the morning! A slight alteration in shape, size, colour, odour, or habit of a fungus is quite enough with many fungologists to constitute a new species, and if the species go on increasing in numbers at the present ratio for a few years longer, no one will at length be able to master the plants, or even the literature of a single genus. To merely look over the figures and description of one section of one genus of Peziza in No. 1 of Dr. Cooke's *Monographia* is enough to send an ordinary mortal into a cold sweat. No doubt there are differences, permanent or otherwise, in some of these little red Pezizas, with their little spores and little basses, but we hope the day is not far distant when at least one-half the species will be knocked on the head, to the despair of their founders.

TRUFFLES.

In some parts of the Downton Woods, especially in the open places, there is a luxuriant growth of a common moss, Minium hornum (= Bryum hornum). Whilst walking over this dense and tall growing moss the quick eye of M. Cornu detected a yellow mycelium known to belong to the singular black, club-shaped fungus termed Torrubia ophioglossoides. This Torrubia is a parasite upon a spurious sort of underground Truffle named Elaphomyces muricatus, and the yellow mycelium (explained M. Cornu) was running over and amongst the moss in search of its underground victim, the Truffle. A careful search just under the surface of the ground in the neighbourhood of the mycelium infested moss, soon brought the "Truffle" to light, and in one instance the perfect parasitic Torrubia itself was found by Mrs. Chapman. In the search for the Elaphomyces, another curious underground fungus came to light, viz., Cenococcum geophilum, and the fact was also observed that mice were searching for, and eating the same Elaphomyces, so that there was a race between the mycelium of a fungus and mice, in search of the same object to prey upon. It is well-known that squirrels and mice are in the habit of searching for, and devouring when found, the Truffles of our markets (Tuber æstivum). Truffle dogs will also eat the Truffles if not carefully watched, as will the trained Truffle-hogs of France.

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DESCRIPTION BY THE ARTIST OF THE WOOLHOPE MÉNU.

FOR such readers as may not be so deeply versed in fungi as the Members of the Woolhope Club, appended is a brief explanation of the allusions to be found in the pictorial border of the *Ménu* card. Beginning at the top, the pleasant faces seen in the "edible" fungi, and the dolorous mementos manifest in the "poisonous" ones, explain themselves. The former are suitable for frying, and "Fries" is the greatest living authority on fungi; the latter cause unpleasant symptoms, and pain us—"Panus" is a genus of fungi; the pill-box, pill, and medicine bottle, are represented by the genus of fungi, named "Pil-o-bolus." Mr. Berkeley, in the top centre, is being attacked by a starry puff-ball (a species of vegetable octopus), and his exclamation of affright naturally takes the form of another genus of fungi, named "Odontia." It will be observed that Mr. Berkeley, has let fall his *Outlines of Fun-gology*. The bottle of "Currey" on the left, immortalises Mr. Frederick Currey, the famous fungologist. "Kneiffia," underneath, is a genus of fungi, and "Forkia" is a genus shortly to be established. The cuneiform inscription indicates the character of the fungoid octopus, as well as the Colorado beetle at Hereford. The porcine quadruped on the left, points to Dr. Robert Hogg, who has published a book on fungi, and the inscription, "Non Sow," indicates that he is not to be confounded with Sowerby. The umbrella handle and great knife on the left always appear at the Hereford Meetings; they belong to Mr. C. B. Plowright, the famous surgeon and fungologist of King's Lynn. The wine bottle bears the name of renowned wine merchants who supply so many fungus-eaters with their (as pronounced after dinner) "Sphæria Champign." "Sphæria" is an immense genus of fungi, and "Champign" is Champignon with its tail off. On the right, we have Dr. Bull, the physician, of Hereford, supporting "Cornu" (Latin for Dr. Bull's Horn of Plenty). M. Max Cornu, of Paris, is one of the highest living authorities on fungi, and was a guest at Hereford. The chains and ropes ornamenting the bovine nose, indicate the power and irrepressible energy of Dr. Bull. Leveille is the name of a great fungus author, and refers, at the same time, to the "veal" which, at an early period, clothes the bones of all oxen. "Magnus" refers to Dr. Magnus, of Berlin, the fungologist. The greatness of this author's name has expelled the cork from the bottle to the knife blade above. "Badham," on the dried pig's leg, refers to Dr. Badham, who wrote *Esculent Funguses of England;* whilst the mole hanging head downwards indicates the miserable condition of Mr. Lees' "molar theory," which referred the formation of fairy-rings to the underground gyrations of the mole. "Hygrophorus" (the water-bearer) is the name of a large genus of watery fungi, and the "Myxomycetes" are a large group of fungi now attracting peculiar attention. "Phallus" is a genus of fungi, which does service here in indicating that there is no fallac-y as to the quality of the wine consumed. Some fungi bear special corkscrew-like springs for use in dispersing the spores; the springs are named "elaters," therefore, the corkscrew figured, is, in more senses than one, an "elater." The bottle of cider on the left, and "Agaricus cider-is" are synonymous; and "Du Port," on the right, is the name of an excellent fungoid Canon, from Norfolk, who attends the Hereford Meetings. Arriving now at the bottom, we have "Tode," a writer on mushrooms, together with a figure of "Boletus edulis," beheaded. Hussey, Broome, Cooke, and Curtis, are all renowned fungologists. Hussey and Cooke are in conflict, the latter has just thrown a rolling-pin (Clavaria—a genus of fungi) at the latter, and is now in the act of discharging a basin of batter (Batarrea—another genus of fungi) at her opponent. The cook's name is Psalliota, a sub-genus of fungi; the hussy's name, Polyporus, a large genus of the same class of plants. C.E.B., M.A., on the hussy's weapon, point to the name and degree of Mr. Broome, the fungologist. "Sparassis" is an important genus of fungi, which is here hinting to the combatants how to proceed when their artificial weapons are no longer available. "Crucibulum" is the name of a large genus of fungi, and means a saucepan; the "Batch," inside, is the name of a great fungus author. "Flammula,"—a little flame—is a sub-genus of fungi; and "Fries' Epi-crisis" (the fat in the fire) is the name of the best text-book of fungi in existence. The nature of the Woolhope Ketchup, or "cats-up," was fully described in the *Gardener's Chronicle*, last year. As a matter of fact, the word "Poissons" (fish) was misprinted "Poisons," by the printer; the error was overlooked by the revising editor, and appeared as "Poisons" on all the cards on "the fungus dinner table."

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Diner a l'Hotel "Green Dragon"

le 4 Octobre, 1877.

POTAGES.

A la queue de "Bœuf;" et du "Coprinus Comatus."

POISONS.

Turbot à la sauce d'homard;
Morue aux huitres; Fricassée de Soles;
Consommé d'Anguilles.

REMOVES.

Aloyau superfin à la sauce relevée de
"Woolhope Club." Bœuf salé.

ROTI.

Dindon roti aux Truffes.
Salmi de "Lactarius deliciosus."
Des Oies rotis à la sauce douce aux pommes.
Poulets à la béchamel, et rotis.
Boudin de "Bifteck" et des Rognons.
Des Saucisses; Jambons; Langues de Bœuf, &c.,
et du "Craterellus CORNU-copy-oides.

ENTREMETS.

Fruits à la tourtière; patés;
Crême à la Vanille; Gelée de Macédoine.
Boudin doré, &c., &c.

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M. Cornu, in referring to the latter animals, termed them "learned pigs." Immense quantities of Agaricus nebularis were found later in the day; these were often covered with the mycelium which, under favourable circumstances, gives rise to the parasitic Agaricus Loveianus. In the moss-house in the woods the Messrs. Fortey provided a most sumptuous repast of ham, meat pies, cake, bread and cheese, whisky and champagne. The same gentlemen also provided a substantial tea at Ludlow, so that the fungologists were well refreshed, and all retired tired to Hereford. Mr. Vize (his marriage well over) joined the party in the train.

On Wednesday, October 3rd, Dinmore was visited as usual; M. Cornu was too tired to accompany the excursionists; Dr. Bull, Dr. Hogg, and some others, remained at Hereford for the committee meeting of the Pomological Department; and one or two other members remained to examine and sketch the apples and pears, and to put the fungi in order. Dr. Bull again entertained the visitors from a distance, at dinner, and all adjourned to the Free Library in the evening, where Mrs. Chapman was found still busy sketching. Other members now discussed poisonous fungi; the best and readiest antidotes to fungus poisoning were pronounced to be found in oil and milk, the latter to prevent the poison laying hold of the coats of the stomach, and brandy to be used as a reviver.

Thursday, October 4th, was the "Club day," when the Whitfield lawns were visited, by the kind permission of the Rev. Archer Clive. A larger number of excursionists than usual left Hereford in various vehicles, and horseflesh proved so limited that the Woolhopeans were obliged to enlist for their services two rank jibbers and four jet-black undertaker's horses with flowing manes, long tails, and a funereal trot. Amongst the fungi found may be mentioned one of the true Truffles, Tuber puberulum, Agaricus dryinus, Cantharellus tubæformis, Peziza æruginosa in abundance, Russula Queletii, Clavaria cinerea, Hygrophorus chrysodon, Helvella elastica, and Stemonitis fusca. On leaving, Mr. Archer Clive had kindly prepared a good luncheon for such as cared to partake of it.

THE DINNER.

There were seventy-one Woolhopeans at the "Green Dragon" dinner, and the following *ménu* shows the nature of the repast set before the guests:—

Potages: à la queue de "Bœuf;" et
du "Coprinus Comatus."
Poissons: Turbot à la sauce d'homard;
Morue aux huitres; Fricassée de Soles;
Consommé d'Anguilles.
Aloyau superfin à la sauce relevée de
"Woolhope Club." Bœuf salé.
Dindon roti aux Truffes.
Salmi de "Lactarius deliciosus."
Des Oies rotis à la sauce douce aux pommes.
Poulets à la béchamel, et rotis.
Boudin de "Bifteck" et des Rognons
Des Saucisses; Jambons; Langues de
Bœuf, &c., et du "Craterellus
cornu-copy-oides.
Fruits à la touretière; patés;
Crême à la Vanille: Gelée de Macédoine
Boudin doré, &c., &c.

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Craterellus cornucopioides was a highly-relished novelty, cooked in honour of M. Cornu. This fungus, when prepared for the table, has a somewhat singular appearance, being jet black in colour, and in this resembling burnt onions. Its odour is highly inviting, and its taste truly delicious.

After dinner Dr. Bull gave a record of the progress of mycology during the year. In this report he touched on all the new work done by fungologists since last autumn, and pleasantly referred, at some length, in the French language, to the visitors from France and their works, so well known and appreciated in this country. In happy and well-selected terms, he bade them a hearty welcome to the Woolhope meeting, and then, again breaking off into English, he gave a welcome to Dr. Bennett, of New South Wales, who was at the head of the table. Dr. Bull's speech was followed by some remarks (also in French) from Dr. Steele, of Abergavenny. The speech, by its fluency and pleasant allusions, took the room by storm, and was replied to, first by M. de Seynes, and then by M. Maxime Cornu. Both gentlemen expressed themselves delighted with this, their first visit to England, and with the generous and hearty welcome they had received at Hereford and elsewhere. They said how pleased they had felt to meet so many English botanists, and how the different societies of France were arranging fungus gatherings after the exact manner of the Woolhope Club. The Rev. C. H. Bulmer then read a report on the progress of the forthcoming new illustrated work, to be named *The Herefordshire Pomona*, in which work it is proposed to give life-size coloured figures of all the best Apples and Pears grown in Herefordshire. The last paper at the Green Dragon was a humorous one, by Dr. Cooke, termed "What is the use of Fungus Hunting?"

THE SOIREE.

At eight o'clock, a soirée, attended by a large number of botanists, was held in the house of Thomas Cam, Esq. Here microscopes with high powers were ready, and serious work was commenced. M. Maxime Cornu described at some length, in the French language, a disease of the vine, named "Anthracnose," observed in the environs of Narbonne; the description was accompanied by a series of beautifully-executed drawings. The same gentleman exhibited highly-finished drawings of new Agarics and other fungi. The next paper (by the writer of this report) was on a fossil Peronospora from the scalariform axis of a Lepidodendron from the Coal Measures. The fungus, therefore, existed during the Palæozoic epoch. One of the remarkable points in the plant exhibited, was that zoospores could be seen under the microscope, still *in situ*, and another point of interest was that these zoospores, and, indeed, the other parts of the parasite exactly agreed, in size and habit, with the similar bodies found in the fungus of the potato disease at the present day. The paper was illustrated by enlarged drawings, and the actual specimens were exhibited under the microscope. This extremely ancient fungus is now named Peronosporites antiquarius. The writer of this also exhibited a singular growth of Penicillium glaucum at the bottom of a bottle of callocine.

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The Rev. J. E. Vize then read some notes on a singular development of the spores of Puccinia Conii, illustrated by drawings and specimens. This paper was followed by one from Dr. Cooke, on the Myxomycetes, and some notes by Mr. Phillips on Pezizæ. Time would not permit of reading the Rev. Augustin Ley's paper on the "Mosses of Herefordshire," which all regretted, although it was nearly midnight when the last of the visitors left Mr. Cam's house.

ANOTHER EXCURSION.

Friday, October 5th, was devoted to an exploration of Lyonshall Wood and neighbourhood near Titley. Amongst notable plants found here, may be mentioned, Uredo vacciniorum, Puccinia veronicarum, Nyctalis parasitica, N. asterophora, Ptychogaster albus, Lactarius glyciosmus, Agaricus vaccinus, and many other rarities too numerous to mention. The Rev. J. E. Vize lighted on Poronia punctata growing on a discarded fragment of a rustic's corduroy breeches. After this district had been well searched, the Woolhopeans drove direct to Moor Court, where they were most hospitably received by the Rev. James and Mrs. Davies. Here an excellent dinner had been prepared, and over this dinner, till dark, the fungus men discussed fungus subjects in a variety of languages. French was probably most pronounced, often mixed with English; when both failed, Latin came to the rescue, with, sometimes, a touch of Greek—when all languages fell short of a clear meaning, drawing, as a last resource, was resorted to. As an example, no one at our end of the table could remember the French for Cranberry-pie; whereas Vaccinium Oxycoccus-pie was common to all? And so, with many thanks to the kind host and hostess, the party drove off, in the black darkness of evening, to the Titley station. Owing to the nature of the vehicles, and the quality of the quadrupeds, the party was late at the station, but such is the respect with which fungus-men are held in Herefordshire, that the station authorities detained the train for six minutes, till the arrival of the party.

ODDS AND ENDS.

Amongst objects of interest in the Woolhope Room, may be mentioned four singular Vinegar plants in what once was a bottle of cider. They were overlooked till the last moment, as every one took them to be four tracheæ, or windpipes, or something of the sort, in spirit, belonging to one of the doctors of medicine present. The true explanation of the singular growth is probably as follows:—A small vinegar plant at first grew on the top of the cider, in the neck of the bottle, and as layer on layer got formed, the plant took the shape of the neck of the bottle, till it got heavy and dropped to the bottom in the form of a windpipe. When the first plant had fallen down, another got formed and dropped away for a third, till at last all the four perfect plants were free in the liquid. Another singular growth was shown in a plant of Craterellus cornucopioides, in which a curious lip-like growth on the edge, had embraced a branch, and carried it up in a tight fold, reminding one of Mr. Darwin's observations on the leaf of Pinguicula. Had the twig been a slug, a crane-fly, or a worm, we should have had an imitation "carniverous fungus" at once. Mr. Berkeley sent for exhibition Cantherellus cinereus and Craterellus sinuosus. It will be observed how much alike in sound

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the generic names are. Unfortunately for the two genera, certain species belonging to one or other, are also so much alike in character and habit that it is almost impossible to refer them with certainty to one or the other; and, to make matters worse, the Craterellus of one book is often the Cantherellus of another. Mr. English, of Epping, sent Sistotrema confluens, Telephora multizonata cristata and sebacea; on the table we noticed Lenzites sepiaria, Polyporus nummularius, P. Schweinitzii, P. ribes, P. sanguineus from South America (Mr. Percival), Cynophallus caninus, Peziza auricolor, P. corium, a large, handsome jet-black plant, brought from King's Lynn, by Mr. Plowright; Agaricus phlebophorus, A. inamænus, Lycoperdon saccatum, Telephora caryophyllea, and many others. As regards hybridian and cross species in fungi, it is worthy of note that a plant was exhibited exactly intermediate between Helvella laconosa and H. crispa; the plant in question had the black and somewhat plain pileus of the former, and the larger growth, and snow-white, deeply-ribbed, and hollow stem of the latter. As regards the fungus of the potato disease, Mr. Broome stated that he had repeated his experiment this year, with potato leaves infected by the Peronospora, by placing them in water; in a week's time the leaves were again completely filled with resting-spores. Mr. Bicknell mentioned a curious fact in regard to Boletus scaber. He stated that he had recently seen about 10,000 specimens, growing in groups or masses, all within a quarter of a square mile, on Gray Common, near Chiselhurst. It is usual to see the plant in single specimens only. There was an exhibition of apples and pears at the same time with the fungi, and the specimens were so numerous that they filled a second room downstairs, and some were even placed upon the floor. There were more than 3,000 specimens exhibited.

All the fungus men met at Dr. Bull's house for the last time on Friday evening, October 5th, when M. Maxime Cornu exhibited a series of drawings and plates (at present unpublished), illustrative of the life history of the Phylloxera and its ravages upon the Vine. M. Cornu explained the illustrations in detail, and all present agreed that the drawings were the most highly finished, elaborate, and exhaustive illustrations they had ever seen. Dr. Cooke exhibited drawings of Agarics, and some of larger fungi; Mrs. Chapman showed a series of boldly executed and richly coloured drawings of fungi, many having been made in France and Switzerland; and the writer showed a drawing of Agaricus campestris, with traces of a volva.

FAREWELL!

The French visitors and some others left Hereford by an early train on Saturday, several Woolhopeans being on the platform to see them off, and by mid-day all the fungus visitors had left the place. The 1877 meeting was the tenth, and though funguses had been uncommonly scarce in number all through the autumn, yet the 1877 meeting will always be remembered as in every way the most pleasant and successful of the entire series, on account of the additions made to the flora, the importance and newness of the papers read, and the thoroughly enjoyable nature of the excursions and meetings.—W. G. SMITH, in the *Gardeners' Chronicle.*

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Woolhope Naturalists' Field Club.

AT the October meeting of this Club, Dr. COOKE read a paper on an interesting family of fungi, called Myxogasters. They are found growing on rotten wood, decaying grasses and ferns. Some are parasitical on plants. One, a Spumaria, is not at all uncommon, in the autumn, enveloping living grass in a mass of foam. In their early stage these fungi are entirely gelatinous, and because they then possess a kind of motion called amœboid, have been referred to the animal kingdom. When mature, they resemble little puff balls, and appear to consist entirely of a capsule, enclosing a mass of threads and dusty spores. Dr. Rostafinski, a Pole, has given special attention to these fungi, and has written a monograph, in which he proposes a new classification of the family, founded on his observation of their structure. Dr. Cooke, the author of the *Handbook of British Fungi*, in his zealous pursuit of natural science, deliberately set himself to learn the Polish language, in order that he might translate this monograph, and perfectly understand the views of a naturalist who had made the Myxogasters a special study. At the same meeting also, Mr. WORTHINGTON SMITH read an interesting paper upon a fossil fungus discovered by him.

THE STRUCTURE AND CLASSIFICATION OF THE MYXOMYCETES.

For many years there has been a feeling amongst mycologists that the myxogasters, or myxomycetes, were in great want of revision, and that their classification was not by any means satisfactory. It must be conceded that the venerable Fries, with an extraordinary pre-science of their relationships, classed these, as well as other groups of microscopic forms, with marvellous accuracy, when it is remembered that he did this independently of the microscope, yet it was no longer expedient to ignore internal structure, and no classification would keep pace with the rapid advance of microscopical investigations, which did not take advantage of its revelations. For some years one or two Russian mycologists were working at this group, but the language in which their observations were recorded effectually sealed and preserved them from the mycologists of the rest of Europe. Then Professor de Bary directed his attention to the mycetozoa, as he termed them, but, unfortunately, he associated with his facts an untenable theory, which soon after he had to abandon, finding, at the same time, no little discredit had attached to himself in consequence, and, therefore, he wisely left to a pupil to accomplish the work he had commenced. It is hardly necessary to remark that

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the theory which de Bary proposed and abandoned was that the myxogasters were more related to low forms of animal life than to the vegetable, and should be classed near the rhizopoda.

The myxogasters are all rather small fungi, if we except one or two genera, and, when fully matured, are like little puff balls, but, unlike them, their early stage is gelatinous and pulpy. Generalizations are necessarily unsatisfactory, however useful they may be for conveying superficial information, and hence, subject to the reservation that there may be some exceptions, we would venture on some casual observations on the structure of these fungi.

Let us assume that they are mostly about of the size of a rapeseed or mustardseed, that they are more or less rounded or egg-shaped, and are often collected in clusters. We are well enough acquainted with a hen's egg. If we place one upon its small end we have the form of many Myxogasters very many times enlarged. In the egg we have a shell or peridium containing lime, this has a tough translucent membranous lining or inner coat, and within this fluid, ultimately becoming solid, living matter, which bursts the shell irregularly and becomes free. We know that in its earliest stages this egg has a coating without lime, and is impressible. So with the Myxogaster. At first it is a minute globule of whitish jelly—or at least when first visible to the naked eye—of an homogenous gelatinous nature throughout, and instantly yields to the touch. Gradually the outer shell or peridium becomes distinct in its character from its contents, it secretes lime in many cases, and thus maintains its similarity to a hen's egg. At the same time it acquires colour—sometimes yellowish, sometimes reddish, sometimes brownish or grayish, and occasionally of a chalky whiteness. Meanwhile, the contents are undergoing change, becoming more and more opaque and solid, until at length they become differentiated into a pulverulent mass, the shell becomes ruptured, and the spores escape. It will be seen that the resemblance to an egg holds good only for a little time, and is not real but fanciful. This will be more evident as we proceed to further particulars. For instance, although sometimes seated direct upon the matrix, it is not unusual for the peridium to be elevated upon a stem, and when there is no stem, the point of attachment has a decided swelling in the interior of the peridium, at times swelling into a boss or nob, or at others passing nearly to the top of the peridium like a pillar or column, and this is called the columella. When a stem is present, this column is really a prolongation of the stem in the interior of the peridium. This is not the whole that has to be learnt of the columella, for, whether short or long, whether reduced to a small boss or elongated into a column, it gives off, in most cases, threads of a very variable character, from all parts of its surface, and these threads pass from the columella in the centre outwards through the mass of spores, until they reach or touch or grow to the inside wall of the peridium. These threads which pass from the columella are termed the capillitium, and they are the branches on which the fruit or spores are generated, but from which they are very soon detached.

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Here then we have the essential features of the Myxomycetes. Small rounded bodies, at first gelatinous, then acquiring a peridium or coating, which often contains lime, and is usually coloured more or less brightly, sometimes with and sometimes without a stem, containing often a projecting boss or column in the centre of the interior, called a columella, from which radiate the threads of the capillitium, which threads are of the nature of sporophores or spore bearers, and it may be added that these spores are usually globose. Bearing these general ideas in mind, we may endeavour to comprehend the classification which has been recently proposed.

The outlines of the new method were announced by Rostafinski, in his inaugural dissertation, and were published in the Continental journals. A year or two afterwards a monograph was written, and this was published in a quarto volume in the Polish language. This work was very much like the traditional Welshman's pony, it was difficult to get, and not worth much when caught, on account of the language in which it was written. The next step was the author's visit to Western Europe, to Berlin, Paris, and London, and during this tour he enlarged his acquaintance especially with exotic forms, in the unique herbarium of the Rev. M. J. Berkeley, and then returned to Lemberg to write a supplement, and again modify his classification.

Subsequent to his visit to this country we became acquainted with the monograph, and through the kindness and courtesy of the Rev. M. J. Berkeley were favoured for some months with the loan of his copy of the monograph. It became fruitless to attempt to find a botanist with a knowledge of Polish, and hence from sheer necessity we at once set to the task of acquiring enough of the language to comprehend the system and translate the essentials of the monograph. As the result of this effort we are enabled to detail the principal features of the classification which Rostafinski has propounded.

Leaving out of the question the two divisions of exogenœ and endogenœ, which Rostafinski has now virtually abandoned, we find that the first step in the classification has relation to the colour of the spores. The larger portion of the Myxogasters have spores of a purplish brown colour, or as our author terms it *violaceous*, the residue with spores of other colours, often bright coloured. Sometimes there will be difficulty in determining to which group certain species belong, since some spores in *Physarum* or *Didymium* perhaps will seem to possess very little violet, and some of the species of *Lamproderma* will have spores which appear to resemble them very closely. In the majority of instances no difficulty will arise, collateral features will always come to our aid.

The next important feature in the classification is the capillitium. In some few instances no capillitium is developed, so that in both sections there will be two sub-divisions, in one of which a capillitium is always present, and in the other it is absent. In this manner the whole of the Myxogasters are distributed into four groups. In the violet spored group the section without capillitium has one order, and the other with a capillitium has two orders, whilst in the coloured

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spore group, each section, with or without a capillitium, has two orders, so that we have here seven orders distributed over four groups; in four of the orders a capillitium is always present, in three it is absent.

If we take each section and group in which there is more than one order, we see that the principal features which are relied upon as distinguishing the orders from each other are:—

In the violet spored group with capillitium; deposits of lime on the surface or outside the sporangium in one order; without deposits of lime on the surface in the other orders.

This is a technical distinction which will seldom come into requisition, since the characters of the families in each order will soon be acquired, and after all it will be discovered that practically the characters of the genera and families are the most useful.

In the coloured spore group with capillitium, one order has a columella, and the other none. In the group without capillitium one order has a perforated or reticulated inner wall to the peridium, which usually becomes exposed, and in the other order there is no such inner wall.

It would be tedious and unnecessary to proceed in this manner to analyse the families and genera in each group, which can be done by anyone for himself with the English translation before him. It will be found that in all genera where a columella or capillitium is present, the distinctive features of the genus are derived from the one or both; and in genera, which possesses no capillitium, that the distinctive features will be found in the character of one or both walls of the peridium, or in the peridium in its entirety and its habit of development.

If we take one family as an example, it will illustrate the mode in which the principles are applied. In this family the threads of the capillitium are thickened at intervals in the form of warts, spines, rings, half-rings, or reticulations, and this is the Arcyriaceæ.

In *Lycagola* several sporangia are combined into a globose complex or compound sporangium. In the other genera the sporangia are simple. In *Oligonema* the capillitium consists of single tubes. In *Lachnobolus* the network of the capillitium is grown to the whole walls of the sporangium. In *Cornuvia* the network of the capillitium is quite free. In *Arcyria* the ends of the network are grown to the base of the peridium.

Thus it will be seen that certain characteristics of the capillitium constitute the distinguishing features of the genera, and a similar method is adopted in other families.

A word or two as to the limits of species. This will probably be the first point of divergence between Rostafinski and continental mycologists. There is every probability that the whole classification will be universally accepted down to genera, but when we come to the limits of species, it is more than probable that a vast accession will soon be proposed. It must be conceded that Rostafinski

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himself is not uniform in his generally broad views of species. Of this we might instance two examples—*Didymium macrospermum* and *Trichia affinis;* in the former only distinguished from its ally by a flattened columella, and in the latter, the absence of minute lines on the threads, which, when present, can scarce be detected when magnified 500 diameters.

Analytical keys, attached to each of the larger genera, will afford a clue to what is regarded as essentials, and here our remarks will necessarily be of a negative character; and those who have been working on the old system will find that they have much to unlearn. In the first place, colour is esteemed of no specific value whatever; hence, such names as *Arcyria cinerea*, *Arcyria punicea*, *Arcyria incarnata*, are discarded for others which bear no relation to colour. This is an innovation of doubtful value, even supposing colour to be of no specific value; it is always impolitic to increase synonyms without urgent necessity. Although not prepared to contest this assumption, it may be asked why colour in the spores is accepted as one of the fundamental divisions, if permanence of colour is only found in violet? and why violet should be permanent and ferruginous not? In all fungi, colour alone is too slight a basis for specific distinction, but, combined with other features, it has an undoubted accessory value. For a very long time *Arcyria cinerea*, *Arcyria punicea*, and *Arcyria incarnata*, have been determined on the faith of their colour chiefly, and although we now recognize distinctive features in the threads, this was not known, and therefore not taken into account in the past. Rostafinski does not attempt to show that these external features of colour and habit failed in correctly determining these species. There are no citations of error into which authors may have been led by such a course, and this is strong evidence that colour should not be wholly despised. It may be that in escaping from one extreme, Rostafinski has sought refuge in another. Without referring to special instances in which we fancy there is evidence of this, we will be content to wait until experience indicates the happy medium.

Another thing which has to be unlearnt, is the value of the stem. Many species, as formerly described, were characterized as stipitate, and others as sessile. This is met by the assertion that internal structure has demonstrated, that, especially in such genera as *Physarum* and *Didymium*, the same species is sometimes sessile, sometimes stipitate, and sometimes the sessile peridia are confluent in an irregular form called a plasmodicarp. Hence, in many species we have a stipitate form, a sessile form, and a plasmodicarp. In this view I am disposed to concur. Since attention has been directed to this feature, I have found a *Craterium* of the stipitate and normal form, with some peridia quite sessile, and three or four individuals all running together into a plasmodicarp, on the same dead leaf. This is an extreme and exceptional case, for Rostafinski himself has not indicated this in the species of *Craterium*, in which the stem and peridium is usually remarkably distinct, and I must confess that this experience influenced me strongly in favour of Rostafinski's views.

There are two other points to which I must allude, briefly, in conclusion. In the genera *Badhamia*, as originally constituted, and in *Enerthenema* and *Enter-*

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idium, it has been affirmed, most decidedly, that in an early stage several spores united together in a globose mass are included in a hyaline sac. Unless we greatly misconstrue Rostafinski's observations, he denies that fact, that in any instance, or at any stage, is there an investing membrane, and previous observers have, therefore, been deceived in what they supposed they had seen. This is an issue between Messrs. Berkeley and Broome and Rostafinski, and between them must be decided.

The other point to which I would allude is the structure of the capillitium in the two allied genera *Physarum* and *Didymium*. All who had any experience of Myxogasters under the old system are aware, that often they were in great difficulty in determining to which of these genera a specimen would belong. According to the present arrangement there need be no such difficulty, since in *Physarum* the capillitium forms a network, thickened at the angles; and in *Didymium* the capillitium consists of threads radiating from the columella to the wall of the peridium. A pocket lens is often sufficient to detect this difference in mature specimens of the two genera.

There are other interesting features to which some allusion might have been made, as for instance the ready and satisfactory manner in which Mr. Phillips and myself determined a specimen of *Cienkowskia*, which he could not satisfactorily determine on the old method, and which consequently has been determined as British since the publication of my revision of the British Myxogasters. Another satisfaction is one which I have experienced in examining a very large number of specimens of *Trichia*, and found little or no difficulty in their determination within the limits fixed by Rostafinski. These are practical proofs of the advantages which even a slight acquaintance with the method of classification now proposed has over the old method.

Having verified a great number of the figures reprinted in the "Revision" by an examination of the species themselves, I can testify to their general accuracy, and in such instances as *Clathroptychium*, the extraordinary structure which Rostafinski has so well elucidated.

It has always been said, that of all fungi the Myxogasters are the most difficult for any but the most accomplished and experienced mycologist to determine, but such cannot now be affirmed with truth, since anyone with ordinary intelligence and perseverance will have no difficulty with the genera, and but little with the species.

A FOSSIL FUNGUS.

Mr. Worthington Smith, in his paper, said:—"I believe that the fungus I have named *Peronosporites antiquarius*, in the scarlariform axis of the stem of a Lepidodendron from the Coal Measures, has, up to the present time, only been examined in a somewhat slight manner, and has never been searchingly looked into. No description, except that of a Mucor, also from the Coal Mea-

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sures, has hitherto been published of any well-defined fungus belonging to the Palæozoic series of rocks. It is, however, possible that a paper in the *Annals and Magazine of Natural History*, 4th series, vol. iv., 1869, p. 221, and tabb. ix. and x., describes and illustrates a fungus of a somewhat similar nature with my Peronosperites. The paper in question is communicated by Messrs. Albany Hancock, F.L.S., and Thomas Atthey, and purports to describe five species of 'Archagaricon' from the Cramlington black shale. The authors state that the fossil fungus has been found at Newsham and in other localities. They, however, describe 'lenticular swellings' with a 'reticulated surface,' which I have never seen, and spore-like bodies within the mycelium, which is clearly an error of observation. The authors also refer their plants to *Sclerotium stipitatum*, and they say they can find 'no important difference' to distinguish this latter plant from their coal fungi. Of course, *Sclerotium* is not a fungus at all, but a mass of condensed mycelium, and the Cramlington plants do not resemble Sclerotia.

"One of the most instructive groups of threads and fruits, or more properly speaking, mycelia and zoosporangia (or oogonia) as seen within the vascular axis of the Lepidodendron, has been enlarged 250 diameters. Beginning with the mycelium, a close examination of this, shows that it is furnished with numerous joints, or septa. If, therefore, any reliance is to be placed upon the modern distinguishing characters of the now living species of the Peronospora and Pythium, as furnished by a septate or non-septate mycelium, then the fossil parasite belongs to Peronospora, and cannot belong to Pythium or any of the Saprolegnieæ. The oogonia do not agree with those of Cystopus. Within many of the fossil oogonia of the group illustrated, this differentiation of the protoplasm into zoospores is clearly seen; but if any doubt could exist as to the exact nature of the differentiation, then other oogonia (or zoosporangia) on the same slide, show the contained zoospores with a clearness not to be exceeded by any living specimen of the present time. One of the most perfect groups of these Palæozoic bladders, containing the once mobile spores, has been enlarged to 400 diameters, and the wonderful fact becomes manifest, that the bladder is exactly the same in size and character with average oogonia of the present day, especially with the same organisms belonging to *Peronospora infestans*. The contained zoospores are, moreover, the same in form and dimensions with the zoospores of *Peronospora infestans*, when measured to the ten thousandth part of an inch. For comparison, an oogonium and group of free zoospores have been enlarged 400 diameters, and belonging to the fungus of the potato disease. On examination it will be seen that the organisms are apparently identical. The average number of zoospores in each oogonium is also the same, viz., seven or eight. The aërial condition of the fungus has not yet been observed.

"In *Peronosporites antiquarius*, we then, probably, have one of the simple primordial plants of the great family of fungi. The Peronosporæ are closely allied to the Algæ—so closely, indeed, that De Bary says the species of the former may, with reason, be compared with the species of one group of the latter, named Sapro-

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legniese; other botanists place the Saprolegniese amongst true fungi. If Peronospora is, therefore, an Alga (and its extremely close relationship is doubted by none), we have, in *Peronosporites antiquarius*, a plant, which, from its extreme antiquity, lends some favour to the views of Sachs and other evolutionists. These observers place the lower Algæ amongst the primæval plants from which fungi and all other cellular Cryptogams have branched. This position is hardly invalidated by the presence of the more highly organised vascular Cryptogams living at the same period of time with the primordial Alga or fungus.

"The evolution of animals and plants is quite comparable with the ages of stone, bronze, and iron, with reference to the different tribes of the human family. Because the stone age dates back to dim antiquity, it does not follow that it has entirely vanished from off the face of the earth. It is clear that the law which called the Peronosporites into existence countless ages ago is in force now, and that this law produces the same results now as then."

ON A SINGULAR DEVELOPMENT OF THE SPORES OF THE PUCCINIA CONII—FCKL.

[By the Rev. J. E. Vize.]

On the 6th March in the present year (1877) I was passing along a field in Forden, edged by a sloping bank facing westward. A plant which evidently belonged to the *Umbellifera*, seemed very sickly indeed as to its leaves, which were of a yellow tint, instead of having the greenness of spring, and yet they were of recent growth. These leaves, one or two of which I gathered, seemed to me to be suitable for a *Peronospora*, but on turning them over I could not anywhere detect a mould. Still feeling sure that the yellow tint was very unnatural, I examined the whole plant carefully, and then found that near the stems at the crown of the *Umbellifer*, which proved to be *Conium Maculatum* (Linn.), some of the stalks were attacked with the *Puccinia Conii* of Fckel. I collected a considerable quantity of specimens, and took them home for examination. Knowing from experience that no plant for the microscope is nearly so perfect after drying for the herbarium, as when mounted quite fresh, I prepared four slides at once. Looking at one of them some days after, I observed that some of the spores were trilocular, and a few were even more than trilocular. Moreover, the septa in some cases were very peculiar; they were not transverse, but assumed whatever angle suited them best. Some of them had the pedicel irregularly placed. The wood-cut accompanying this paper will best show their singularities; they are all taken from the four slides, and the four slides all came from the same pustule. I hoped that every pustule on every portion of the Hemlock was the same, as to development, and was not aware that such was not the case for many weeks after. A friend of mine in Manchester, believed, against fact, that I promised him a specimen, and rather

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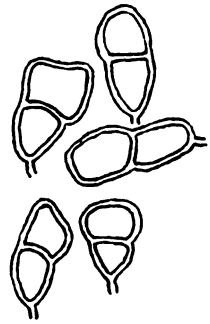

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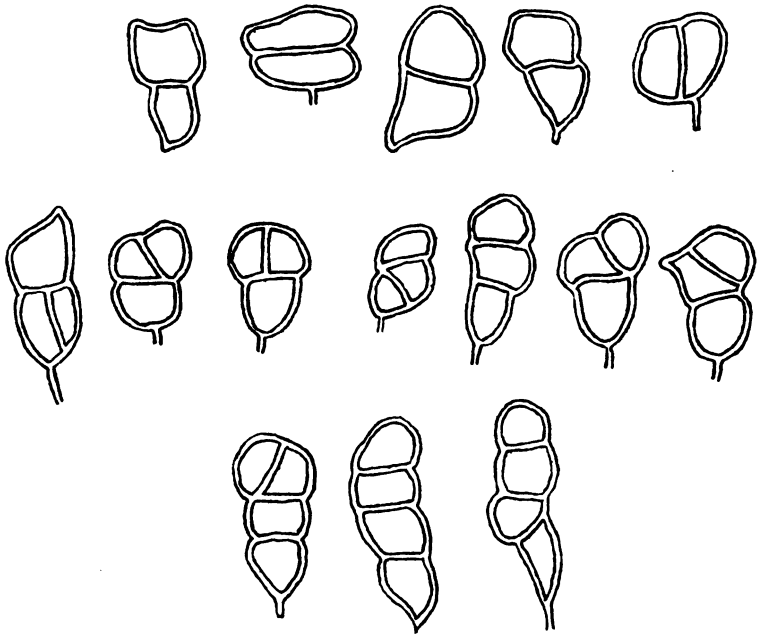

B

× 500 dia.

PUCCINIA CONII. Fckl. var.

J. E. Vize, ad nat. del. W. G. Smith, sc.

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than that he should be disappointed, I searched for a pustule containing these multiseptate spores, for two hours one evening, and one-and-a-half hour the next morning, before I could find one. At last I succeeded, and sent the example off by post at once. Hence, these polymorphic spores must be very unusual, and I consider myself fortunate to have hit upon a plant that bore them. Besides, this success singularly confirms, in my mind, the figures given at plate 75, by Dr. Greville, in his Scottish Cryptogamic Flora of *Puccinia Variabilis*. He draws the spores as being, in some instances, more than uniseptate. May he not, by good fortune, have hit upon examples in which the spores of the *Leontodon Taraxacum* were eccentric, just as I did on the spores at the stems of the *Conium Maculatum*?

On the 21st of April, I visited the spot where the *Puccinia* had so singularly grown, but all the originally infested stalks, etc., were gone utterly. The *Conium* looked very healthy, but not one *Puccinia* could be found; nevertheless, the *Trichobasis*, which is an *Uredo* form of the plant, was very abundantly scattered over the leaves.

My next journey to the place was a few days after the field had been mown for hay, and the *Conium* was cut down. However, on the 29th May, I found the plant elsewhere in my parish, when it had but very few *Trichobasis* spores; they were much more of the true *Uredo* type.

At the end of July, 1876, I was staying at Aberystwith, and found plants of *Conium* bearing the *Puccinia* and the *Uredo*, the former on the stems and stalks, the latter on the leaves.

Here then, we have a part of the life-history of the *Puccinia Conii* from the beginning of March to the end of July. In March, the *Puccinia* was in perfection. So vigorous was it, that it utterly sapped the life out of its host. Fresh leaves of the hemlock grew; these produced the *Trichobasis* at the end of April. On the 29th of May the *Uredo* prevailed, whilst in July there was the *Puccinia*. But there is, in some respects, a vast difference in the *Puccinia* of July and that of March. The July form grows in round, oval, or elongated patches, and when elongated, grows up the stem. It is small, and covered with epidermis of the *Hemlock* for a considerable time, and, *at length*, bursts through it with difficulty, a process which makes the spores themselves rather smaller than in the early spring plant. It does not distort the stem materially, if at all. The colour of the epidermis has, perhaps, a little more blue than in the other case.

Now see the March form. The patches are not round; they seem to assume any shape except that of regularity. They are large, very large, and do not appear to have the slightest difficulty in getting through the epidermis of the Hemlock. They blister the stem fearfully, making large bullate patches; they twist the stem into all sorts of shapes, except straight, and very soon kill the Hemlock.

Probably our German friends would make two species of these plants, but, with all deference to them, I cannot help thinking that our English mycologists would keep them just as they are. If an explanation be asked for the exceeding

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richness of the spores of the March plant, for the spores so easily breaking through the cuticle, for their polymorphic shapes, for their injuring their host as they do—I venture to suggest that in March the *Conium* itself is growing, and, therefore, the *Puccinia* finds an easier nidus on which to increase as to its mycelium; it can better get its nourishment; and, above all, it can meet with little opposition in bursting through its host, because the cuticle thereof is tender, soft and young; whereas, later on in the year, it is much harder, much more like straw. This fact has enabled me, indirectly, to confirm Dr. Greville's figures of *Puccinia Variabilis* as to their veracity, to show that *Puccinia Variabilis* is not a true species, but a variety, and to write about a singular development of the spores of the *Puccinia Conii*.

J. E. VIZE.

Forden Vicarage, Sept. 22nd, 1877.

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Woolhope Naturalists' Field Club.

ADDRESS BY THE RETIRING PRESIDENT, J. GRIFFITH MORRIS,

APRIL 23RD, 1878.

IN the work of education during early life, little is done to draw out and develop two of the principal faculties with which man is endowed—observation and manipulation. Habits of seeing quickly, observing accurately, and discriminating minutely are not acquired without learning to use the eyes. Nor are delicacy of touch with lightness, accuracy, and steadiness of manipulation without a similar education of the hands. Readiness and accuracy of investigation and observation are likely to be of more service to most men in everyday life than any amount of scholarship, whether classical or mathematical. Examining Boards are now doing much to enforce the study of science at schools, and the coming generation, not content with exclusive classical education, will go forth into the world better prepared to advance the material interests of mankind.

> This earth is beautiful indeed,
> And in itself appeals
> To eyes that have been taught to see
> The beauties it reveals.—*Montgomery.*

From the study of any branch of Natural History two sources of advantage are to be expected—a beneficial result on the mental and physical powers of the individual, and the practical utility of the knowledge gained. The student becomes a wiser and better man; he becomes elevated and refined, a love for the true and beautiful is created within him, and his enjoyments are increased in proportion.

Mycology is a subject with which the name of the Woolhope Club is especially connected; it well illustrates the truth of these remarks, and inasmuch as little progress can be made in its study without the aid of a microscope, additional educational advantages arise, for that instrument in itself demands the practice of patience, order, and observation, and developes the senses of sight and touch.

Mycology presents a wide and fertile field of research. The progress of recent science demonstrates more and more that the growth, reproduction, and life history of minute funguses is of vast importance in the economy of nature.

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To their unseen causation are due most of those changes which affect organic life. Under their influence organic tissues alter their form of vitality.

What is called decay is in truth but a process to other forms of life, sometimes beneficial to man in the production of wholesome food, and more often injurious by causing disease and pestilence.

It is ten years since our Club commenced the study of Agarics, and that series of discussions and papers began which have since given so much renown to it. The subject was scarcely introduced when in the following year prizes for collections of funguses were for the first time given at South Kensington, and Dr. Bull took the chief prize for Herefordshire.

In the autumn of 1868 the first fungus foray was made to Holme Lacy, under the superintendence of our staunch friends, Messrs. Lees and Worthington Smith. These forays have gradually grown in interest, increasing numbers join them, and an abundant supply of papers notifying new facts and discoveries, are annually read.

Many of the most distinguished mycologists have done us the honour of attending them. The Club will be proud to mention the names of Berkeley, Broome, Cooke, Currey, Plowright, Phillips, Rennie, Vize, Houghton, Percival, Cornu, De-Seynes, and several others, who have again and again been present at our forays.

The active interest of our members in the study of funguses was at once excited by calling attention to the edible kinds. It was shown that a large amount of vegetable matter containing nitrogen, hitherto allowed to waste year after year, might be utilised as food. Experience has shown, however, that an idea so philanthropic, is not in England practically feasible. Few species of Agaric are edible, more are tasteless or disagreeable, and some that are poisonous are unfortunately too common.

The comparative scarcity of uncultivated land in this country, and the uncertain, and, as it were capricious growth of Agarics, put quite out of the question any reliance on them as a source of food for the people, the more especially as other food is happily so abundant. It still remains, however, for the scientific epicure to distinguish and profit by them, as he assuredly may do, and gather from them a varied and delicious relish.

The study of Mycology deserves all the ardour with which it has been recently followed; to it we owe the knowledge of those destructive agents the various kinds of moulds, smuts, rusts, &c., that are called blight. The term blight is too indefinite. It is indiscriminately applied to funguses, to insects, and to diseases caused in the young and tender parts of plants by sudden alterations in the temperature, or amount of moisture in the atmosphere. Most living plants and animals are at times more or less infested with funguses, which are nourished at their expense, to very often the eventual destruction of both. Some

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of these parasites attack man himself, as shown in the production of various kinds of ringworm and thrush. The belief is growing that diphtheria, cholera, low fevers, and other such complaints, may be caused by microscopic funguses. It is an unhappy fact, that these parasitical pests take up a residence on those vegetables that are the most useful to man, viz., those which produce starch. Of these the cereals are the most important. Rust and mildew attack the leaves, stem, and bracts, while ergot, smut, and bunt attack the organs of fructification of barley, wheat, rye, oats, maize, rice, and other cereals. The corn rust and mildew are the same species of Puccinia in different stages of growth. It may be found on almost every grass in every part of the world; it seems to have a preference for wheat. General attention appears to have been directed to it for the first time in 1804, when Bauer made drawings for George III. The wheat of that year contained only 604 parts of starch and gluten in 1,000 parts, instead of the 995 parts of the nutritious matter which it ought to have contained. In 1806 the quantity was absolutely reduced to 203 parts. In 1810-11-12, when wheat was at its highest price during the war, corn rust was so prevalent and severe, the foliage of the plants so eaten up with it, and in consequence the grain so small and shrivelled, that, much as it was wanted, it was not considered worth while to thrash it out. It has been noticed that severe attacks of corn rust must have more than once been coincident with the appearance of cattle plague. The last time that the cattle plague was prevalent in this country the clothes of people walking through corn fields became orange coloured from the dusty spores falling on them. Smut is individually a very minute fungus, and yet of all the corn parasites most readily attracts attention. It is a species of Ustilago that attacks the anthers and ovaries of wheat, barley, oats, maize, and rice, plants whose fertility and well-doing are of the utmost importance. It appears as a white viscid fluid, which dries up into a sooty, pulverulent mass. A German some years since attempted to prove that this powder was simply a collection of diseased cells, and therefore not a fungus, but he was easily refuted, for he was shown in the miscroscope the germinating spores.

Bunt (*Tilletia caries*) is a concealed foe, its residence is in the growing seed, and it is not till the farmer takes his sample after threshing, that he detects the presence of this pest (the little bunch of pappus at the upper end of the seed is not white, as it ought to be, but dark and dusty). On careful search he then finds some distorted grains containing a fœtid powder, which, under a microscope, is seen to consist of brown reticulate spores. Of course the presence of much of this fungus would be detected in the flour by its colour and smell, but the miller gets rid of the affected grains by rolling and blowing. This fungus has not been destructive for some years.

In northern and cold countries where the soil is poor, rye is almost the only cereal grown. This grain is peculiarly liable to the attack of a fungus called Ergot. It is often present in such large quantity that when ground up and eaten a train of peculiar symptoms is produced called ergotism, and instances are mentioned in which the continued use of the diseased grain has caused death. The

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same fungus grows on some of our pasture grasses, and often occasions great mischief to cattle.

In some parts of France the peasantry do not object to eat mouldy bread, and in most instances with impunity, but the species of mould varies, and alarming effects have sometimes followed. These, together with experiments performed on animals, prove that bread in a state of mouldiness will cause death. M. Barrul, the French analyst, who reported to his government on these cases, advises "that as most people are unable to distinguish the species of mould, the use of all bread in such a condition should be avoided."

Next in importance to corn, as a starch producing vegetable, is the potato. Many funguses attack it. The Peronospora Infestans that is so very destructive is one of the white moulds. The mycelium of this fungus is able to penetrate every part of the plant, discolouring and corroding the green parts, and causing loss of vitality and decay in the tuber. Partial observations of several mycologists had revealed much of its life history and mode of growth during the summer, but it was for an honorary member of the Woolhope Club to discover how it survived the winter. It has long been known that some funguses, like insects, go through several stages or metamorphoses. The final and perfect stage is easily recognised in most insects, because that is the only one that has the power of reproduction, but among funguses every stage is able to propagate itself in some way, thus in summer the potato blight throws off from the free ends of its mycelial threads two kinds of short-lived spores, which if they fall on the leaf of a potato, germinate and quickly reproduce themselves, killing their victim and perishing with it.

Our friend, Worthington Smith, had the good fortune, while investigating the natural history of this fungus, to discover another kind of spore, called resting spore, because it hybernates in or on the ground. He watched its mode of formation in the autumn, and its growth the following spring, and then was enabled to prove that this spore was the long sought for means by which Peronospora Infestans continues its existence from year to year.

This spore is to be found in the tissues of the decaying plant. It is formed by a process of conjugation not uncommon among funguses; by degrees it acquires a hard protecting coat, and with the dying plant, falls to the ground, where it remains, to take its chance during the winter; on the return of warmth, the hard coat bursts, mycelial threads exude and extend in search of a foster mother; if they do not meet with a potato plant in growth, they speedily exhaust themselves and die; but if unfortunately successful, they pierce the cuticle, and the work of destruction commences.

Through want of thought and custom, much is done that favours the existence and propagation of this pest, diseased haulm and tubers are left on the surface of the ground, when the crop is taken up, and are afterwards dug in to serve as manure. If this happens in a garden or rented potato ground, and the same crop is put in a second year, a vigorous crop of Peronospora is the result, and the cottager scarcely gets his seed back. The potato blight is also extensively propagated

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in another way; in most houses it is usual to throw away diseased tubers, along with parings and other rubbish, into dust heaps, which are in due course carted away, and used as manure; it is probable that storing potatoes in the same building or floor, year after year, favours the spread of the disease.

Mr. Worthington Smith's discovery teaches that every part of an infected plant should be burnt; it is the only way of effectually destroying the fungus; and also, that under no circumstances should potatoes be planted for two consecutive years in the same ground.

Parasitical fungi, not content with damaging corn and potatoes, are also very injurious to garden produce; cabbages, beans, peas, celery, and onions, each of them cherish and foster some unbidden visitor—fruit trees, as pears, plums, peaches, filberts, and walnuts, furnish a residence for some unwelcome intruder.

Flowering plants, grown for their beauty, are much injured, and sometimes killed by parasitical funguses, witness the rose trees and holyhocks; two years out of three, hopyards are rendered unproductive by the attacks of an Erysiphe.

Timber trees do not suffer much while in growth, yet it is curious to number the varieties of fungus found on them. M. Wessendorf says, "That 74 attack the lime, of which 11 reside on the leaf; 114 the spruce fir, and no less than 200 the oak;" among the latter are reckoned those funguses whose ravages in timber-built ships have occasioned a loss in fourteen years, estimated at twenty millions, and which, in church and domestic architecture, produce great annoyance and expense by causing dry rot. Merulius, Lachrymans, Polyporus, Hybridus, and a Thelephora are the funguses which prey on sound timber; their mycelium creeps between the cells, and decomposes tbe lignin and cellulose; the Merulius has a rusty-coloured, irregular, stemless pileus, from whose gills a liquid constantly exudes.

If the useful plants of other countries are examined, we find in the south of Europe, olives, oranges, and onions damaged by a fungus that envelopes their leaves in a covering of soot; in the Atlantic isles and France, the Ordium Tuckeri destroys the grape-vine. This fungus first appeared in an English hot-house, and thence has spread in all directions. Our friend, M. Cornu, told us, last October, that another fungus had lately appeared on the vine at Narbonne, causing a disease called Anthracnose. In some parts of Italy, the cultivation of the silk-worm has been suspended because it is attacked and destroyed wholesale by a species of mould, somewhat resembling that which kills flies in the autumn, and leaves them adhering to the glass in our windows, surrounded by a cloud of white spores; in America the maize is often much injured by a smut that causes large and curious distortions of the grain and cobs. The plant which of all others is the most important for clothing purposes—the cotton plant—has two formidable enemies; one attacks the leaves, the other the pods.

Some manufactures are much impeded by the growth of moulds. Bleaching cannot be carried on in the fields, on account of moulds growing and causing un-

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sightly and irremovable blotches on the fabric. The preparation of gelatin, maccaroni, lime juice and wines requires precautions to be taken to prevent access of air containing spores of fungus. It would not be difficult to extend the list of noxious funguses, but enough has been said to show that man's person, food, clothing, building materials, and occupations are all injured by divers species of fungus. In proportion to the amount of injury they cause, they become important. It must be desirable, therefore, that their structure, habits, and life history should be carefully studied, so that advantage may be taken of every opportunity of lessening or preventing their injurious effect.

The chemical process of nutrition in funguses is not the same as in other vegetables. Funguses do not convert inorganic matter into organic compounds. They possess a vital force capable of overcoming the natural play of chemical affinities, and they live by appropriating the constituents of the compounds they are thus enabled to decompose. Fermentation is nothing more than the manifestation of this process of decomposition. Such fermentations as are not produced by the immediate action of living cells, are called indirect. They are caused by the intervention of nitrogenous soluble matters elaborated by living cells. These soluble ferments are often stored up till circumstances require their alterative action. It would seem that most organic substances are subject to fermentative changes, often occasioned by a special ferment plant. There are other ferment plants besides those that are recognised as funguses. Sugar undergoes several direct fermentations — the alcoholic, lactic, viscous, and butyric. Alcohol by fermentation becomes acetic acid; albuminous matters and urea are transformed into ammonia by processes of fermentation.

It will be interesting to sanitarians to know that there is reason for believing that the conversion of ammonia into nitric acid is caused by the presence of a fungus; this process has been called nitrification. It goes on constantly in soil that is saturated with decomposing animal matter. The saltpetre of commerce is for the most part imported from India, and is obtained by washing it out of the soil. Nitrification has long been known, and carried on artificially. Pasteur suggested that it might be a fermentative change, and some recent experiments show that he was probably correct. MM. Muntz and Schliessing passed sewage water through a porous medium, for eight days there was no change in the amount of ammonia, but after that time ammonia disappeared and nitric acid took its place. This experiment is only explicable by supposing that germs of a ferment plant were present and took time to mature. This notion was confirmed by another experiment, which proved that the presence of antiseptic vapours suspended the action. Among fermentations, the alcoholic takes the first rank, it is the most familiar and the most easily studied. There has been considerable difference of opinion as to the nature of the plant which causes this fermentation. Most English authorities have considered till lately that it was a modified growth of a common mould called Penicillium. German mycologists make it into a genus belonging to the class Torulæ, among funguses. They call the genus Saccharomyces, and include within it several species.

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Common yeast is Saccharomyces cerevisiæ, the composition bakers use has very small cells and is called S. Minor. The yeast that grows on malt liquor when left to spontaneous fermentation, as is the practice in Belgium, is S. Apiculatus. Other species appear on musts of wines, and juices of stone fruit. The species that is so important in this district, because it effects the transformation of apple juice into cider, appears under the microscope to be identical with that which is found on malt liquor, viz., S. Apiculatus. Pasteur has proved, by a simple experiment, that germs or spores of Saccharomyces exist on the surface of grapes. He introduced boiled grape juice into a series of thirty flasks; of these ten were immediately sealed up; into a second ten he dropped a minute quantity of a liquid prepared by washing the surface of some ripe untouched grapes; into the third ten he passed some of the same liquid boiled; in 48 hours the first ten were unaltered, the second ten were in full fermentation, and filled with flakes of mycelium; the third ten were unaffected. There is reason for believing that all saccharine fruits have on their surface spores which remain quiescent till a concurrence of circumstances brings them into contact with the enclosed juices, then subaqueous growth commences, accompanied by the decomposition of the sugar, so long as the subaqueous growth continues propagation of the fungus takes place by budding, but as soon as the sugar is exhausted the fungus comes to the surface and forms spores. Saccharomyces cerevisiæ, or common yeast, is seen under the microscope to consist of a multitude of granular cells, diffused through a turbid liquid called yeast water. The cells are ·003 of an inch in diameter, and like all other vegetable cells in their simplest stage, consist of a speck of jelly called protoplasm, enclosed in a non-nitrogenous envelope. Yeast is composed principally of albuminous and amylaceous matter, but it contains a large proportion of phosphates of potash and magnesia. The remarkable feature in its composition is its richness in nitrogen. Funguses contain more nitrogen than any other class of plants. The Chantarelle contains 3·62 per cent.; Boletus edulis, 4·25; Lactarius deliciosus, 4·60; Mushroom, 7·26; and Yeast, 10; so that it closely approaches animal matter. These agarics have been selected for comparison, because they have been often set before us at our Fungus Foray dinners. Knowing the chemical composition of yeast, we should expect the medium in which it flourishes to contain the nitrogenous and mineral matters which it requires. It has been proved by experiment that yeast will not exert its peculiar action on sugar unless these matters are present in solution.

We all know that if yeast be added to a liquor at a suitable temperature in which malt or some saccharine fruit has been digested, certain occurrences will ensue. The liquor will shortly become turbid, effervescence will take place from the escape of free carbonic acid, the sweetness will disappear, alcohol will become evident to the taste and smell, and a large increase will take place in the bulk of the fungus.

There are several varieties of sugar much alike in their chemical composition and properties. The two principal are saccharose and glucose. Yeast acts differently on each, so that it will be well to trace back their relation to, and forma-

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tion from, starch. Starch, chemically, is nothing more than carbon, combined with the elements that compose water in the proportion of six to five. It appears to be the first product of that decomposition of carbonic acid and assimilation of the carbon, which, under the influence of the sun's rays, is continually going on in growing plants. Starch is the basis from which most other vegetable secretions are formed. It is either used up at once by the plant that secretes it, or it may be laid by for future use; sometimes in the tuber as in the potato, in the seed as in corn, or in pith as sago. Saccharose, the sugar of commerce or cane sugar, is made up, like starch, of carbon and water; but the proportions differ. Instead of six to five, in saccharose it is twelve to eleven. This sugar is found in the maple and beet; whenever found it is intended as a store for the future use of the plant at the time when a great and sudden demand is made for the purposes of reproduction. Glucose is the sugar met with in the grape and other fruits; it contains a little more water than saccharose and is more soluble. It is necessary that stored-up starch and saccharose should be altered into glucose before they are used by the plant. This alteration is always prepared for by the laying up of nitrogenous matter in close approximation with the stored material. When the food is wanted, the nitrogenous matter acts as indirect ferment, and causes the starch or saccharose, whichever it may be, to take up an additional quantity of water, and become glucose. Thus the starch stored up in the barleycorn is altered into glucose when heat and moisture bring the nitrogenous matter called diastase (which has been laid up under the cuticle), in contact with it. This process takes place in seeds when they germinate, and is taken advantage of by the maltster. For the same reason the tuber of the potato becomes sweet and transparent from the alteration of its sugar into glucose when growth begins. Again, when sugar cane and beet blossom, a large supply of nutriment is suddenly wanted; the stored-up saccharose is then digested, that is, altered into glucose, and is carried away in the sap to the reproductive organs, to be there reconverted into starch, and stored up again in the seed. Parsnips, and some other sweet roots that do not blossom in the first year, lay up glucose itself, which is held in reserve till the next summer, then seed is formed, and the root loses its sweetness and collapses.

If yeast be placed in water containing air or oxygen, the oxygen gradually disappears, and is replaced by carbonic acid; a process exactly similar to the respiration of fishes, continuing day and night, but proportionately more active. The yeast would die when the oxygen was absorbed, but if the glucose be then added, the fungus will abstract from it the oxygen required, and set free carbonic acid and alcohol. Pasteur, who has given great attention to the life history of ferments, has concluded, after many experiments, that a continued supply of oxygen, and the combustion it causes, are necessary sources of energy for the development of vitality in ferment plants. As soon as the cells of yeast have exhausted the glucose in contact with them, they have a tendency to come to the surface and take on their aerial growth, which is simply the formation of spores. Under favourable circumstances some of the cells at the surface may be observed under

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the microscope to form an additional internal membrane, which, becoming septose, divides the protoplasm into three or four parts, each of these parts becomes sperical, opaque, and ultimately detached as a spore. The nutrition of yeast in one particular resembes that of the higher order of plants, for it is supplied with a soluble nitrogenous ferment which enables it to alter saccharose. This nitrogenous matter may be separated by washing the cells in water. Every time they are washed some of it is dissolved out. It is always acid, and if neutralised becomes again acid. Directly that it comes in contact with saccharose, the latter is forced to take up an additional atom of water, and thus become glucose. The multiplication of the cells of yeast by budding is a process that may be easily watched under the miscroscope. If the temperature is kept between 75 and 90 degrees, one or more cells may be seen to arise in succession, or even at the same time, from a parent cell, and form themselves into short irregular chains. The vitality of yeast is dormant below 50, and is destroyed, as we should expect, at 140 degrees, for at that temperature nitrogenous matter begins to coagulate. The growth of yeast is checked if the solution of sugar is too dense, or if the quantity of alcohol is too large. Attempts have frequently been made by physiologists to account for these phenomena, but how and why carbonic acid and acohol are substituted for sugar is still a mystery, and like other mysteries connected with vitality, is likely so to remain. It has been ascertained that the weight of the alcohol and carbonic acid is nearly equal to the weight of the sugar which has disappeared. The slight difference is caused by the formation of other compounds that only appear in minute quantities. Some think that the glucose and other materials that form the food of the yeast plant penetrate the cell by osmose, and there, after undergoing transformation, are assimilated and converted into growing cells and tissues, while at the same time disassimilation is proceeding, the worn-out tissues are changed into alcohol and carbonic acid, and are eliminated as excrementitious matter. This may be called the intracellular theory. Pasteur is of opinion that the vital action of the shell causes decomposition of the glucose, and that a portion of its oxygen penetrates the cell membrane and takes part in the process of assimilation, while the other constituents of the glucose are left outside free to arrange themselves into carbonic acid and alcohol. This is the extra-cellular theory. Which is correct? It remains for some one, perhaps a Woolhopian, to determine.

In this agricultural and woodland county there is abundant opportunity for the study, not only of the parasitic funguses, but of most others, and as our Field Club was constituted for the purpose of observing and recording all facts connected with the natural history of the district, it is to be hoped that some of our members will forthwith set up their microscopes and become students themselves. The facts observed at the time may often appear isolated and of little consequence, but subsequently by combination and further discovery they may become of the greatest value. Minute scientific research always precedes the application of science to industry, and though little acknowledged, is at the present day performing a very important part in intellectual and industrial advancement, and will, ere long, effect great and unexpected changes.

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The study of Pomology is not strictly within the range of natural science, and yet in a county so celebrated as is Herefordshire for its apples, and the wine made from them, it is a study of paramount importance. The members of the Woolhope Club have often considered this subject, and in consequence of a conversation held at the Fungus Foray of 1873, the Rev. M. J. Berkeley sent down grafts of the most esteemed varieties of apples from the gardens of the Royal Horticultural Society of London. These sorts, 95 in number, were distributed among the members of the Club and to the leading nurserymen in the county. In 1876 an exhibition of apples was held under the auspices of the Club, and this was repeated very successfully last year. The value and quantity of apples grown in Herefordshire, and of the cider made from them, is but very insufficiently appreciated. From official returns condensed in the "Farmer's almanack" of 1877, by Mr. Webb, of Tunstall, it appears that about 4 per cent. of the total acreage of Herefordshire is laid down in orcharding. The total area of the county is 532,898 acres, and therefore 21,500 acres is the extent of orcharding. With this basis for calculation it seems possible to arrive at a rough estimate of the value of the apple crop. In these days of cheap and rapid transit, all apples of size and colour meet with a ready sale for edible or culinary purposes. At least one-quarter of the fruit grown is now sold in this way, and called pot fruit: the remaining three-fourths is made into cider. To consider first the cider fruit, at the very low average of 60 bushels of fruit, or three hogsheads to an acre, it will produce 48,375 hogsheads, worth, at £2 a hogshead, £96,750. The pot fruit at 60 bushels to the acre, and 3s. a bushel—a very low price—will be worth £48,375. It must also be remembered that pot fruit is grown in almost every garden, and this, if estimated at the same value and quantity as that grown in orchards, will yield £48,375, and thus we arrive at the large sum of £193,500—the total value of the apples grown in the county. If then these calculations are correct, the 21,500 acres of orcharding in Herefordshire should return, taking one year with another, with ordinary care, more than £6 an acre, without reckoning the value of the underneath crop; we know that it is not uncommon for orchards to return £10 per acre.

To this day cider is generally made, as it was centuries ago, by the labourers on the farm, with a minimum of care, labour, and superintendence. Most of the details, such as the selection, growth, preparation, and crushing of the fruit seem, in a theoretical view, to be each of them capable of improvement. Almost the first consideration in the culture of the apple is the selection of sorts to the purpose for which they are required, whether it be the mill, the kitchen, or dessert. With the view of aiding the grower in making a selection, the Woolhope Club have decided on publishing a Pomona, in which every apple and pear worthy of cultivation for acknowledged good qualities—such as productiveness, hardiness, flavour, sweetness, &c.—will be described, and its outline or coloured representation given. Dr. Hogg, the well-known Pomologist, has kindly offered to edit the work for our Club, and thus the accuracy and care with which it will be produced are amply guaranteed.

It only remains for me now, gentlemen, in order to carry out literally the 8th rule of our Club, to give a brief general summary of the field meetings of the

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past year. The first meeting was fixed for Mordiford, on May 17th, but a hopeless incessant downpour of rain, which continued the whole day, prevented the excursion. In the afternoon the members met and listened to a paper by Dr. Bull on "The Life of Andrew Knight, and his work in the Orchards." Afterwards, Mr. Cam, our Treasurer, presented the Club with a complete series of nature-printed plates of the British ferns. This very welcome and valuable addition to the library of the Club was only loaded with one condition, not unreasonable, that they should be bound up in such a way as to be easy of access and well protected. The second meeting was held on June 19th, on the Midsummer Hill, at the Southern extremity of the Malvern range. About 30 members, and some visitors from the Cotteswold and Caradoc Clubs, walked up the winding path, and soon found themselves on the summit, and here the Rev. W. S. Symonds gave a lucid and energetic address on the geological features of the locality, and concluded by mentioning some traditions connected with the Ragged Stone and Red Earl dyke, which was very much appreciated from being given in situ.

The Club sat down to dinner at the Eastnor Arms, and afterwards, Mr. BLASHILL read a paper on the "Spanish chestnut as a substitute for oak," and exhibited a variety of sections of each, showing the difference in the arrangement of their medullary rays.

Mr. RILEY brought some orchids from a neighbouring locality.

The PRESIDENT showed specimens of, and described a white mould very prevalent at that time, and injurious to young shoots of the apple, rose, and laurel.

Dr. CHAPMAN sent a paper and specimens of Emphytus Serotinus, a fly that for the last two or three seasons had much injured the foliage of the oak.

The third meeting, the ladies' day, was fixed for Tintern Abbey, on July 19th, but fell through for meteorological reasons. It was carried out, however, on August 21st, with complete success. The meeting was appointed for Trelleck, beyond Monmouth, but this was found to be inaccessible. Sixty-three ladies and gentlemen left Hereford by special train, and travelled by the Wye Valley Line through some of the most beautiful scenery in the kingdom; arriving at Tintern at 11.30, they were met by Mr. Blashill, who had kindly come to conduct the party over the beautiful remains of the once magnificent abbey.

Mr. BLASHILL gave a short history of the building, from its commencement in 1269 by Roger de Bigod, to the general dissolution of religious houses in 1537, when Robert Wych was the last abbot. He then pointed out some peculiar features of the architecture. He illustrated his observations, not only by the ruins, but also by plans and drawings brought with him. He directed attention to the elaborate workmanship still evident in many parts, and reminded those standing on the well-kept turf that the floor was once paved with ornamental tiles. The monastic buildings were then inspected; they are ranged around an open space called the Garth. Here Mr. Blashill read a paper on the "General mode of life of Monks." Soon after two, the members of the club and their lady visitors left

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Tintern in their special train for Chepstow; at the Beaufort Arms they partook of a cold collation, and hurried on to spend the rest of the time at the grand old castle of Gwent.

An extra meeting of the club was held on September 20th, to visit Mordiford. The Rev. F. MEREWETHER, of Woolhope, read a paper on the "Drifts in his neighbourhood," and took the members along the road and river-side to Fownhope, to show them masses of *debris* that had evidently been washed out of the Woolhope basin, at places always opposite to well-marked outlets.

In the evening, the Rev. JAMES DAVIS read an interesting account of "Herefordshire Customs," which he has done well to record, ere they pass into oblivion.

Mr. RANKIN also read a paper on "The difficulties of estimating geological time," which ought to have led to an interesting discussion.

The Fungus Foray, on October 4th, concluded, as usual, the meetings of the year. The country chosen was Whitfield, with its fruitful lawns and woods. Funguses were few and far between, and yet some rare truffles and some new Agarics rewarded the search for them, so great is the advantage of hunting with those who know how to find the game. The dinner was at the Green Dragon, where seventy-five covers were placed, and a menu had been specially designed for the occasion. Craterellus cornucopioides had been found in abundance, and, on the recommendation of M. Maxime Cornu, was cooked, making its appearance for the first time at a Woolhope banquet. Its colour was jet black, and its flavour was thought by some of the connoisseurs present to be excellent. After dinner, Dr. BULL gave a cordial welcome, in their own language, to the French gentlemen who had done the club the great honour of coming to England for the first time specially to attend the Woolhope Forays, and called on Mr. Elmes Steele to express more fully the sentiments of the members to Messrs. De Seynes and Cornu. This he did with much ease and eloquence.

Messrs. DE SEYNES and CORNU expressed their thanks for a reception so friendly and grateful to them that they could never forget it. M. Cornu stated that it was in imitation of the Woolhope Club that Fungus Forays had been held in the neighbourhood of Paris for the last two years.

Dr. BULL gave his usual report of the progress of mycology during the last year.

The Rev. C. H. BULMER, next gave a report of the progress of the Herefordshire Pomona.

Dr. COOKE read a highly amusing paper, which set forth, in flowing terms, thirteen different uses of Fungus hunting.

The meeting then broke up in time for the evening trains, but all who could remain attended the soirée given at the house of Mr. Cam, the Treasurer. The following papers were read during the evening:—M. CORNU, on a new disease of the vine, of fungoid origin, that had lately broken out in the neighbourhood of

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Narbonne. The disease is called Anthracnose; the fungus causing it is Phoma uvicola. He spoke of the importance of studying its habits and history, in the hope eventually some means might be found for remedying or preventing its destructive attacks, and he invited English mycologists to assist.

Mr. WORTHINGTON SMITH exhibited under the microscope some fossil zoospores of a peronospora that had been observed in the scalariform tissue of a fern. The fungus had lived previous to the formation of the coal measures. It was curious to notice how closely it agreed in size and habit with the fungus that now attacks the potato.

Mr. VIZE described and showed specimens of Puccinia conii, which differs from other pucciniæ in having multilocular spores, and is especially interesting because it confirms a discovery of a similar nature by Greville.

Dr. COOKE read a clever technical paper on a new classification of the myxogasters, by Rockitanski, and pointed out its difference from the arrangement in the handbook.

Mr. PHILLIPS made some remarks on a Peziza, whose sporules were appendiculate.

There was still another paper that had been rather eagerly expected, on the "Herefordshire Mosses," by the Rev. Augustin Ley, but it was postponed, as it was too promising a subject to hurry through at so late an hour.

Woolhope Naturalists' Field Club.

APRIL 23RD, 1878.

THE annual meeting of the Woolhope Naturalists' Field Club was held at the Club Room, Hereford, on Tuesday, April 23rd. Present: The President, J. Griffith Morris, Esq.; the President elect, the Rev. H. W. Phillott; the Treasurer, Thomas Cam, Esq.; James Rankin, Esq., Rev. J. F. Crouch, Dr. Bull, Dr. Chapman, Rev. W. C. Fowle, Messrs. Kempson, Swinburne, James Davies, Curley, Vassar-Smith, Southall, Paris, Chapman, Theo. Lane, and others.

Mr. Theophilus Lane was appointed Secretary in the place of the late Mr. A. Thompson. The financial statement was read and approved. A complete set of nature-printed plates of all the English ferns presented to the club by their hon. treasurer, Thomas Cam, Esq., was laid out for the inspection of the members.

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Woolhope Naturalists' Field Club.

MAY 28TH, 1878.

THE first field meeting of the Woolhope Naturalists' Field Club took place on Tuesday, May 28th, at Ledbury, for Putley, Marcle, and Kempley. The president, the Rev. H. W. Phillott was on this occasion unable to be present. The Rev. W. S. Symonds, a senior past president, was voted to the chair. There were present—A. Armitage, Esq., Thomas Cam, Esq., T. A. Chapman, Esq. M.D., P. C. Cleasby, Esq., J. H. Cleasby, Rev. W. C. Fowle, — Guise, Esq., J. Greaves, Esq., Rev. R. Hill, Rev. G. M. Metcalfe, J. E. Norris, Esq., T. C. Paris, Esq., G. H. Phillott, Esq., A. Purchas, Esq., J. Riley, Esq., Rev. H. J. W. Stillingfleet, Rev. H. Stone, W. A. Swinburne, Esq., Rev. W. S. Symonds, Rev. J. Tweed, Dr. Wood, Rev. R. H. Williams, and Theo. Lane, Secretary.

John Norman, Esq., F.R.C.S., was elected a member of the club, and several other new members were proposed.

THE ACTING PRESIDENT gave a most interesting description of "The "Wonder" in particular, and landslips in general.

The members were then hospitably entertained at Putley Court by J. Riley, Esq., and after visiting the church, drove to Marcle, where they were kindly received by the vicar. After inspecting the beautifully-restored church the drive was continued to Kempley, and every one was much interested and pleased with the curious old church and cross. It being too late to visit Haffield the members returned to the Feathers Hotel, Ledbury. After dinner Mr. Phillott (the president's son) read a paper on Kempley Church and its mural paintings.—A vote of thanks was then passed to him, and the party returned to Hereford, having spent a very enjoyable day.

THE REV. W. S. SYMONDS, OF PENDOCK, ON "THE WONDER," NEAR MARCLE, AND THE GEOLOGY AND HISTORIC RECORDS OF THE SURROUNDING DISTRICT.

Landslips are much more common than persons are aware of who have not been in the habit of observing the effect of these dislocations of great masses of land on the configuration of a line of country, or the wild and picturesque combinations of scenery they often produce. Landslips are generally due to the hard and soft nature, and geological position, of the rock masses which have slipped. Occasionally they have been due to earthquakes, as in Switzerland, where an

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earthquake some years ago precipitated masses of overhanging rock into several valleys. Generally they are caused by the effect of springs of water accumulating on retentive beds of clay acting on cracks, undermining the strata, and saturating beds with moisture, until a track of land is undermined and is precipitated into the valley below.

The geological formation of the ground has much to do with the kind of landslip. The landslips of Lyme Regis, on the line of coast between Lyme and Axmouth, is an example of such dislocations along a long line of coast, as is also the Undercliff of the Isle of Wight. The Lyme landslip happened in 1840, but even now it presents a wild scene of ruin, exhibiting fragments of once cultivated fields amid chalky knolls, and crags, and broken dingles. The strata of both the Lyme Regis landslip and that of the Undercliff, in the Isle of Wight, are much more horizontal than are those on the slopes round the Valley of Woolhope—whether you examine that of Backbury Camp, above Dormington (Adam's Rocks), that above Pirton, near Stoke Edith, or that of the Wonder, near Marcle. All the Woolhope landslips occur on the line of junction between the harder limestones of the Aymestry rocks and the softer Ludlow shales, while you may observe that the angle at which the beds dip tell of their high inclination from the axis of upheaval. Landslips often occur on lines of joints as well as on lines of high dip. Indeed, wherever we find rocks traversed by joints, or upheaved at a high angle, or interstratified with beds of a porous nature and sloping, landslips from time to time are sure to happen.

"The Wonder" is somewhat classical in its associations, as it is recorded in Drayton's "Polyolbion," and is thus described by Camden :—"Near the conflux of the Lugg and Wye, eastward, a hill, which they call Mardey Hill, in the year 1575 roused itself up, as it were, out of sleep, and for three days together shoving its prodigious body forwards, with a horrible roaring noise, and over-turning all that stood in its way, advanced itself (to the astonishment of beholders) to a higher station by that kind of earthquake, I suppose, which the naturalists call Brasmatia." In 1783 there happened the landslip on the Severn near Buildwas Abbey and Leighton. Here a large mass of earth and wood was precipitated into the Severn, and we find the visitors to the scene of disaster "picking up eels and fishes on dry ground," looking for "curious fossils," a great many of which bore "the impression of a flying insect not unlike a butterfly into which silkworms are changed." I need not say these "flying insects" were the tails of trilobites, and that if the fallen débris of "The Wonder" had been examined at the time plenty of Butterflies would have been found there, as I found at the great slip between Dormington and Stoke Edith which I visited soon after it happened with Sir C. Lyell, who there observed and was much interested in the Pentamerus galeatus, which is also abundant at Niagara. Our English landslips, however, are nothing compared to those which have happened on the Continent, as that of Chiavenna, in Switzerland, where in 1618, the town of Pleurs, with upwards of 2,000 of its inhabitants, were buried underneath a landslip from the side of Monte Conto; or

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that of Mont Grenier, in Savoy, where five parishes were buried beneath rocks and ruins which covered nearly nine square miles. It was just such a wet spring as the present also which caused the fall of the Rossberg, near the Rigi, in 1806. The strata there are highly inclined masses of red sandstone and conglomerates, which dip like the roof of a house; and in the seams caused in the rocks by the washing out of the softer materials, the waters accumulated, and caused the tremendous slips which followed. The effect of this landslip was to destroy entire villages and chalets; more than 400 human beings perished and whole herds of cattle were swept away. One end of the Lake of Lowertz was filled up with the *débris*, and a wave 70 feet high passed right over the island of Schwanau, and stranded numerous live fishes in the village of Steinen.

I have visited the sites of several grand landslips in Ireland as well as those on the Continent. Such are those in Kerry, west of Brandon Head, and in Derrymore Glen, a wonderful sight to see, great cliffs 800 feet high, and masses of piled up ruins of ancient hills. So, too, are some slips in Skye and Mull, off the west coast of Scotland, where the waters percolate through cracks in masses of overlying basalt down to strata of soft lias or oolite below. The landslip at the Skyrrid Vawr, near Abergavenny, has laid bare the upper section of the hill, and I expect that the fossil fishes of the Old Red Sandstone might have been detected among the fragments of broken rocks if searched at the time. We have no traditions of the date of this slip, or that of Adam's Rocks, near Dormington, save that, when I was a boy, both were said to have happened when the rocks were rent at the Crucifixion.

The Woolhope Club knows the geology of its own district so well that it is unnecessary for me to enter into details of the surrounding geology, further than to remind you that in the surrounding scenery you may behold most of the rocks typical of palæozoic geology, or those strata which contain the relics of those old-life forms of animals which frequented the waters of ancient Silurian, Old Red, and carboniferous seas or lakes, while Haffield Camp is a mass of Permian breccias, resting against an ancient shore line, the rocks of which were constituted of upheaved Old Red and Upper Silurian masses. Nearly on a line with Haffield rise the Malvern Hills, on the southern flanks of which appear Lower Silurian deposits and their fossils, in the broken ground which lies about the Chase-end Hill and the Valley of the White-leafed Oak. The axis of the Malverns themselves consists of very ancient gneiss or metamorphosed and altered strata, which are believed to be as old as the Laurentian rocks of America, and these again are traversed by volcanic dykes. The hill on which stands the Eastnor obelisk, as well as Howler's Heath on the flanks of the Chase-end, is the Upper Llandovery rock at the base of the Upper Silurians, and wherever its flaggy grits occur you may find such characteristic fossils as are Stricklandinia and Pentamerus. The Ludlow and Wenlock rocks of the Ledbury district are famous for their fossils, of the Aymestry, Ludlow, and Wenlock series of shales and limestones; and the wooded crests of the ridge-like hills tell you of the hard limestones which

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have weathered beneath untold ages of storm and decay. The softer Old Red rocks have been much denuded, but the old camp of Wall Hills is composed of Old Red cornstones which, like the softer rocks at their base, contain relics of these strange armour-plated fishes which once inhabited the waters in which their sediments were laid down, and whose enamelled plates and scales are beautiful to look upon as they flash out under the blow of the hammer once more beneath the rays of the sun. What changes have occurred; what ages have elapsed; what mountains have vanished; what seas have been changed into dry land; what land into ocean depths; what groups of animals have lived and then died out for ever since those armour-plated fishes swam, living beneath their summer sun. Behind May Hill rises the elevated region of the Forest of Dean. Here, as you are aware, are the Carboniferous rocks resting on the Old Red sandstone, a great outlier of the coalfields of South Wales, which it resembles in every particular of geological structure, and, like the South Wales basin, is surrounded by its belts of Millstone Grit and Mountain Limestone. Here, too, are the noble beeches of the Speech House, and on one side the rich vale of Berkeley and the Severn, and on the other the limestone gorges of Symond's Yat, the Dowards, and their caves full of the bones of the cave lion, the mammoth, the hairy rhinoceros, and the Irish elk, with the rude chipped flints of an ancient race of men. Haffield closes our recital of the geological points that come within our day's notice. Few places show better sections of the puzzling Permian conglomerates, or rather breccias, than that in front of the hall door. The beds, as you may see, are well stratified, and dip under the rocks of the new red sandstone which were deposited in those saline straits in which were segregated and consolidated the great salt beds of Droitwich and Cheshire. These salt beds, too, extend, interstratified with the lower strata of the new red rocks as far as Newent, at the base of May Hill. Near the town of Newent the waters well out sufficiently impregnated to tell us of the salt beds below. There is not much of historical lore to which to direct your attention, but I may ask you to observe that ancient line of camps of British times which stretches from Dinedor Hill, near Hereford, thence to Backbury, by Wall Hills to Haffield, and from Haffield to Gadbury Camp, which rises in the New Red Sandstone Vale by Eldersfield and Staunton. All these places I have mentioned were important strongholds. But who dug their trenches and scarps, and who fought for their capture and defence? I confess I am altogether ignorant. At Gadbury Roman coins and other relics have been found, showing that the Roman invader had penetrated into a country which the Normans found to be covered with "noisome forests;" but I am not aware that the other camps I have mentioned have furnished any relics of the men who manned them. Neither does the noble camp of the Midsummer Hill, which rises above the Eastnor Obelisk, tell us much more of its history. Below, on its flanks, are strong masses, mostly fallen *débris*, in which some love to see the remains of British huts, but like the visions and traditions of the ragged stone these belong rather to the region of imagination than of facts. Ledbury was probably a British stockade when Midsummer Hill was a British camp, and Wall Hills too. At all events, it has its Saxon records

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inasmuch as it was given to the See of Hereford by a Saxon Edwin, who was cured of the palsy by Ethelbert. In Norman times King Stephen granted the charter of a market, and in the days of the Plantagenets St. Catherine and her maid Mabel rode that weird ride from Wenlock, and heard the Ledbury bells ring out a merry welcome to their future abode. Here, too, Bishop Ffolliott founded the Hospital to St. Catherine, where aged men and women still frequent, although the present race of horses do not gallop with their tracks reversed, or the Ledbury bells still ring of their own accord. Much Marcle once belonged, through the grant of Edward I., to the Mortimers, that family of Wigmore, the other side of the county of Hereford, destined to become in one age the destroyers of their King, and later on the founders of a Royal dynasty too. Strange, also, that it is related that Edward II. passed through Ledbury in his hidings from his wife and Mortimer, and that Edward IV. marched through Ledbury on his road to Malvern and Worcester, with his victorious troops, after the Battle of Mortimer's Cross, which led to the Crown of England. There are still some mouldering tombs in the church of Great Marcle which tradition assigns to the graves of some of the Mortimers, while their principal abode, Wigmore, is an utter ruin, a refuge only for the owl and the bat. Dymock is famous as the birthplace of John Kyrle, "the Man of Ross," and Mr. Wynniatt, of the Grange, possesses some very remarkable deeds of the date of Henry IV, and Richard II. Henry IV granted land in Newent to Fotheringay, in Northampton. This little town, which lies below May hill, was the "New Inn," of Leland's time, that remarkable traveller of the days of Henry VIII. It was a house opened for travellers and was formerly surrounded by dense woods and forests, but there appears to have been a priory founded there soon after the Norman Invasion. Only 100 years ago the roads about Newent were impassable for wheeled vehicles as is recorded in a letter of the Earl of Belloment, who, writing to a friend in London, described the ride of his son, Lord Coote, and his bride from Newent to Moreton Court on a horse and pillion, because the road through the woods and mud was impracticable for wheels. A journey from Bitemorton to London in those days was a feat to be written about and described as in these times would be a ride to Khiva.

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Woolhope Naturalists' Field Club.

THE CHURCH OF KEMPLEY, GLOUCESTERSHIRE.

THE following description of the mural paintings at Kempley Church, Gloucestershire, visited by the Woolhope Club on May 28th, 1878, written by J. Henry Middleton, Esq., architect, of Cheltenham, was read by Mr. G. H. Phillott at the meeting. The only change made from the original description is that the few Greek words and the Latin passage from Durandus have been "turned into English" by the President of the club "for the benefit of the country gentlemen."

BUILDINGS.

The church of Kempley consists of a Norman nave and chancel, built probably at the end of the 11th century; their sizes are roughly—nave 34 × 19, chancel 18 × 14 internal measurement. All the walls of this early part remain, with the west and south doors, the narrow chancel arch, and four of the original windows. In the 15th and 16th centuries a western tower was added, a wooden porch built on to the south door, and two perpendicular two-light windows were inserted in the nave probably in the place of original Norman windows. The dedication of this church is not quite certain, but tradition ascribes it to the Blessed Virgin, and this view is supported by the legend on one of the bells, which is "*Dilige Virgo Pia quos congrego Virgo Maria.*" Another bell has the following legend:—"*Jesu campanam tibi semper protege sanam.*" Both these bells date from the reign of Edward III.

CHANCEL.

The chancel, where the best preserved paintings remain, is covered by a plain round barrel vault built in rubble. Such vaults are common in monastic and military buildings of the 11th and 12th centuries; but, excepting the chapel in the Keep of the Tower of London, I do not remember another English instance of a church being so roofed. This vault and the chancel arch have both been seriously damaged by settlement, and a crack along the crown of the vault has much injured the painting on the soffit.

PAINTINGS IN THE CHANCEL.

The whole wall surface of the chancel has been painted, and most of it still remains in a remarkably perfect condition, considering its great age. The comparative freshness of the paintings is chiefly owing to their having been thoroughly covered with repeated coats of whitewash, and thus preserved from the effects of light and

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other sources of injury. This covering of whitewash we removed bit by bit with the greatest caution and deliberation in the winter of 1872, when the existence of the paintings first came to light. The pictures are painted on a single coat of stucco laid on the rubble wall, which in places is scarcely covered by it, and I think there can be little doubt that they are contemporary with the building itself, *i.e.* somewhere near the year 1100 A.D.

PROCESS.

With regard to the technical process by which these paintings are executed, I am convinced that they are not true frescoes, that is, that they were not painted on the wet stucco with purely earth pigments and a lime medium, one reason being that the colour is little more than superficial, and has not sunk into and become incorporated with the stucco as is the case with true fresco. Another is the absence of fresco edges, as they are called, that is, the scarcely perceptible edges that separate the patch of stucco laid one day from that of the next day. For as it was necessary that the colours should be applied to perfectly wet and unset stucco, it was of course needful that no more should be applied to the wall than the artist could cover with one day's work, or in some cases even less. This being the case then, that the paintings were executed on the finished and dry surface of the plaster, they must be in some form of distemper, probably with a medium of egg and vinegar, or perhaps size.

SUBJECTS.

In the middle of the ceiling is a figure of Christ, more than life size, seated upon a curved red object, no doubt intended for a rainbow, and enclosed in a frame or glory of the usual three-lobed shape; a cruciform Nimbus surrounds the head, and resting on the left knee is a book or tablet with the Greek letters which represent the name of the Saviour. Unfortunately the right side of the figure is too much injured to make out distinctly. The feet are towards the east, and below them just outside the frame, the border of which is continued round it, is a large circle much damaged by the crack. This represents the earth made the footstool of our Lord. Right and left of the circle are two six-winged nimbed Seraphs, each bearing a scroll. On either side of the principal figure stand the Evangelistic beasts, the bull and the eagle on the south side, and the lion on the north, holding open books. The fourth beast is rather indistinct; he appears to be issuing from a cloud and to be without a book. All are nimbed. Next, westwards, above the head of Christ are seen the sun and moon. The sun a yellow roundel with white rays all round it, and the moon a blue crescent with a small roundel inside it which looks very much as if it had been a head. At the sides of these great lights are seven candlesticks, four on the N. and three on the S. They are blue with white knops, and have tapering candles. Next are two more Seraphs holding books in one hand or small flags or lances with pennons in the other. Beyond these and close to the chancel arch we find on the S. side St. Peter, nimbed, with a key in his right hand and a book in his left, and on the N. side a figure of the Blessed Virgin carrying a book. She seems to have no

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nimbus, but her head is covered with a veil or hood, surmounted by a sort of trifurcate or perhaps mural crown. All these figures are painted on a broad red band along the top of the vault. This band is bounded by a white stripe on each side, and stopped E. and W. by bands of an interlaced pattern, which are carried all round the walls and vault against the end walls.

The side walls of the chancel are each divided into two unequal parts by windows near the east end. The nothern one is very perfect, it has bands to the inner and outer arches, and the splay of the jambs and arch is covered with a chess board pattern of red, blue and white. The southern window is much injured, but there remains above it, as above the other, a painted canopy of walls and towers. West of the windows are painted on each side six arch-headed niches, in which are seated figures of the Twelve Apostles. They are all nimbed, and hold books. St. Peter, who occupies the eastern place on the north side, is distinguished by a large key which he holds under his left arm. The others have nothing by which they can be recognised. They are not arranged in pairs, as is so often the case, but the attention of all is directed upwards towards the central figure. Below the feet of the Apostles there has been an ornamental band or frieze, some of which remains, but all painting below it is lost, if it ever existed.

Eastward of the two side windows are a pair of niches rather wider than those occupied by the Apostles. In each is a figure without nimbus, and holding a staff in each hand, one carried over the shoulder, and the other used as a support, suggesting the idea that these figures represent pilgrims. Both wear long tunics with mantles fastened on the shoulder, and the southern one has a hat of orthodox pilgrim shape.

The east end has one window with a round-arched head concentric with the vault. Below it is a band of interlaced pattern like that at the ends of the vault.

Over the window are three roundels, each containing a nimbed angel with a scroll, and on each side there has been a large arched niche. Of the northern niche little remains, but in the other is a very perfect figure of a bishop. He is habited in Mass vestments, the right hand raised in benediction, and the left holding a pastoral staff.

VESTMENTS.

The chasuble is dark blue or purple, lined with yellow; it is short in front and long behind, as we find it in other examples of the same date. There is a broad white or grey orphrey down the front, and a light red band round the neck, which I think belongs to the chasuble, and is not the amice, as it would be at a later date.

The dalmatic is white, and reaches to the feet, so that the alb and stole are not visible.

The maniple is thin and very narrow, with expanding ends of white, with a row of tassels on each, as on the stole of St. Thomas of Canterbury at Sens. It

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is worn on the wrist, instead of being held in the hand, as was the more ancient custom, thus showing that this painting is not much earlier than 1100, as the change seems to have taken place in the latter part of the eleventh century.

The mitre is not white, as one might expect, but pale red; it is of the earliest form, and appears either to be worn over a coif, or to have a sort of veil hanging down behind. The crozier is a simple crook, like that found on a bishop's tomb at Durham. At the feet of the bishop, on his right side, is a sort of vase or pitcher, possibly intended for a cruet or chalice. On the left is a yellow circle, enclosing a blue cross; this looks very like a dedication cross, and perhaps is one, but it is not impossible that it may be a paten.

The coloured decoration is continued over the chancel arch, which is in two plain square orders. The outer order is ornamented with a sort of Mosaic pattern, arranged in zig-zags. The inner order has 10 yellow roundels bordered with red.

Considerable damage has been done to the north and south walls of the chancel by two priests' doors which have been broken through the wall, and by the insertion of a rude arch-headed recess, which was either an aumbry or an Easter sepulchre.

NAVE.

The only painting in the nave which appears to be contemporaneous with the Norman building is the large one over the chancel arch, representing Christ in majesty and the last judgment; it is much damaged, and part of it is still concealed by the modern ceiling. The figure of Christ, however, and archangels blowing trumpets, are still distinguishable. The other paintings are probably not earlier than the 15th and 16th centuries. On the jamb of the small Norman window in the north wall there are figures of St. Michael and a female saint. Between it and the next window there is a curious wheel, of 10 circles, the meaning of which is not easy to make out. On one of the jambs of the southern Perpendicular window there is the figure of an archbishop, and the wall west of it has a number of paintings, which seem to be of a still later date.

Paintings like these latter are far from rare in English churches; but I believe we might search in vain for another instance of paintings like those in the chancel and over the chancel arch, of a date so early as the beginning of the 12th century, and with the unity of motive and completeness of design. The nearest to these in date are, I believe, the paintings in the chancel walls of Chaldron church, Sussex, representing the "Scala humanæ salvationis," but they are at least half a century later than the examples before us.

It will be worth our while to compare a very interesting passage in the "Ratio Divinorum Officiorum" of Durandus, I., III., 7, 12, which, omitting the 24 elders, might almost be a description of these paintings. The great work of Durandus was perhaps better known and more widely spread than that of any other author of the early Middle Ages, and there can be little doubt that whoever executed these paintings was well acquainted with the following passage:—

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"Sometimes Christ is depicted as Moses and Aaron, Nabad and Abihu, saw Him, namely, on a hill, and under His feet, as it were, a work of sapphire and a serene sky. And since, as S. Luke says, 'Then they shall see the Son of Man coming in a cloud, with power, and great glory and majesty,' therefore sometimes angels are painted surrounding Him, who ever serve and wait on Him, and they are depicted with six wings, according to the words of Esaias, 'The Seraphim were standing near Him, the one with six wings, the other with six wings, and with twain they covered his face, with twain his feet, and with twain they did fly.' Angels are also depicted as in the flower of youth, for they never grow old. Sometimes also the Archangel Michael is painted near them, treading the Dragon under his feet, according to the words of S. John in the Apocalypse, 'There was war in Heaven; Michael fought with the Dragon,' which war denotes a division between the angels, the establishment of the good, the ruin of the bad, or in the visible Church, the persecution of the faithful. Sometimes also there are painted around about Him the twenty four elders, according to the visions of the same John, in white robes and crowns of gold. Sometimes, also, are included in the painting the living creatures according to the vision of Ezekiel and the same S. John. 'On the right hand the likeness of a man and that of a lion, and the likeness of an ox on the left, and that of an eagle over all the four.' These are the four Evangelists, wherefore they are painted with books at their feet.* Sometimes also there are painted round about, or rather underneath, the Apostles, having long hair like Nazarites. Moreover, the divine Majesty is sometimes painted with a closed book in His hands, because no one was found worthy to open that book except the Lion of the Tribe of Judah. And sometimes He is painted with an open book, so that every one may read in it, because He is 'the Light of the World,' and 'the Way, the Truth and the Life,' and the Book of Life."

*This is from the Douay version.

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Woolhope Naturalists' Field Club.

THE members of the Woolhope Naturalists' Field Club held their second field meeting on Thursday, June 20th, at Ross for Symond's Yat and the Doward.

There were present—the Rev. H. W. Phillott, M.A., President; Dr. Bull, Rev. William Bowell, Dr. Chapman, Rev. G. H. Clay, Rev. R. H. Cobbold,—Flood, Esq., Chas. Fortey, Esq., Rev. James E. Grasett, Edward Howorth Greenly, Esq., Rev Cooper Key, James W. Lloyd, Esq., W. E. Martin, Esq., Rev. G. M. Metcalf H. C. Moore, Esq., J. Norman, Esq., T. C. Paris, Esq., Captain Power, Alfred Purchas, Esq., Captain Mayne Reid, Orlando Shellard, Esq., — Skinner, Esq., Vassar Smith, Esq., Henry Southall, Esq., W. A. Swinburne, Esq., Rev. John Tedman, B. Watkins, Esq., and Mr. Theo. Lane, sec.

The members arriving at Ross inspected the Church, (which has recently been restored), under the guidance of the rector, who afterwards kindly took them over his grounds. The party then went to Symond's Yat by train, and on reaching the top, the business of the club was transacted. Penrith Calvert Cleasby, Esq., John H. Cleasby, Esq., and the Rev. W. H. Gretton, who had been proposed at the last meeting, were unanimously elected, and other gentlemen were proposed as members of the club. Mr. Southall pointed out the surrounding hills of the district, and described several points of interest. The members then took boat about a mile down the Wye to the Dripping well, where they landed to examine it. Returning to the boat they went further down the river to the Old Fish House, where they again landed, and visited King Arthur's and the other caves. Then they ascended Little Doward Hill through the woods to the Iron Tower, descending through the Leys Park to the Lodge on the turnpike road to Crockfords Ash, where the carriages were waiting for the return journey to Ross. After an excellent dinner at the Royal Hotel, Mr. Southall read a very interesting paper on the Doward Caves, the Botany, and other interesting features of the district visited. The Club returned to Hereford by the evening train, after a very pleasant excursion. Many botanical and other specimens were secured.

PAPER READ BY MR. H. SOUTHALL, F.M.S.

In attempting a brief descripton of the district we are visiting to-day I feel as if treading a beaten track, and in danger of repeating what may have been better told before. At the request, however, of some members of the club, and with the view of giving a little information to some who may not have been with

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us in previous rambles in these parts, I propose to allude to some of the more prominent features of the neighbourhood as regards its contour, history, and natural productions, and to give some account of the caves and camps of the Doward Hills. Probably few spots of equal area, at any rate in England, present such a variety of surface and vegetation, or afford a better field for the naturalist than does the border land of the Wye from Kerne Bridge to the Wyaston Leys. A glance at an ordnance map at once shows the broken character of the ground, the remarkable windings of the river, as well as the hills which overhang its course almost throughout. To the lover of natural beauty few scenes can be more charming than are many of the *coups d'œil* from crag, hollow, or mid-stream. The Carboniferous rocks, standing out in grim grotesque shape, resembling pillars, castles, chimneys, needles, &c., or again presenting a perpendicular walled face overtopped with trees and shrubs, whose roots lie embedded in the crevices. These, even on a winter's day, have almost as much beauty as in summer. More rock is visible and there is not only the oak with its brown withered leaves, retained long after many trees have lost their foliage, to form a contrast to the grey limestone, but also the evergreen yews and firs are numerous enough to add very much to the appearance of the landscape. The yews, I may observe, seem specially to favour the line of the conglomerate strata. The geology of the district has been so often described that I will only remark that the conglomerate is nearly the uppermost strata of the Old Red Sandstone, and that the junction with the mountain limestone is here noticed, the transition being clearly marked on the hill below the Iron Tower and in other places. But whilst speaking of the scenery we must not forget that the picturesqueness is very principally due to the river Wye, not here a muddy tidal stream, but one nevertheless of sufficient volume to rush with considerable noise over the rapids, while of breadth enough to reflect in the clear, still waters of its "pools" the remarkable and varying outlines of its richly wooded and often steep banks; its course here and there obstructed by small islands, or by masses of rock, which, having broken loose and slipped down from above, have in the intervening centuries become covered with lichens and moss; and then again much of the richness of effect for which the Wye Scenery is so celebrated is due, especially in spring and autumn, to the different colours and foliage of so large a number of almost every kind of tree, many of which appear to be indigenous. The large extent and luxuriance of the woodland covering the tops and sides of the hills, presents a curious contrast to some of the dales in Yorkshire, such as Wharfdale, for instance. There the timber is pretty much confined to the valleys, while the tops of the hills are bare moors. Here, on the contrary, the valleys are clear, the rest covered. Two or three varieties of the oak are met with in these woods. Professor Babington does not, however, admit that there is more than one species of *quercus* or oak in Britain. The beeches, sycamores, chestnuts, and birches, attain to great size. The large and small varieties of the limes are seen growing close together. The yew, as I said before, is very abundant, as well as the Scotch, spruce, and larch firs. The *Genus Pyrus* is represented not only by the crab tree (*P. malus*) and the mountain ash (*P. aucuparia*), but by the

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service tree (*P. torminalis*), as well as the *P. Scandica* and *latifolia*, and the white beam (*P. Aria*), remarkable not only for its bunches of white blossoms when in flower, and of berries when in fruit, but for the whiteness on the undersides of its soft and downy leaves, which when shaken by the wind present quite a striking appearance. The sloe and bullace (*Prunus spinosa* and *insititia*), the dwarf and wild cherry (*P. cerasus* and *avium*) are common. The bird cherry (*P. Padus*) is very local. The two buckthorns (*Rhamnus catharticus* and *frangula*), the spindle tree (*Euonymus Europæus*), the dog wood (*Cornus sanguinea*), the guelder rose (*Viburnum opulus*), and the wayfaring tree (*P. Lantana*), together with an almost endless variety of roses and *Rubi*, some amongst them considered very scarce by Mr. Baker, the great Kew authority in this branch ; these with the black and red Bryony (*Tamus communis and Bryonia dioica*) the honeysuckle, and the elder, of which three separate kinds may be noticed—the Dane wort, perhaps the most curious—are specially ornamental either from their foliage, fruit or blossom ; and if we add the poplar and willow—the former often filled with mistletoe, and the latter with its never-ending varieties, puzzling even those who have made them a life-long study—together with the common and Wych elm, ash, maple, alder, hazle, and hawthorn, we shall have made a considerable selection from our list of forest trees. And now, whilst on the subject of woods, we may enquire what ferns and other plants are to be found growing in them. Not to mention those which are almost universal, such as primroses, anemones, blue-bells, &c., we may note the cow-wheat (*melampyrum pratense*), the wood sanicle (*Sanicula Europæa*), the sweet woodruff, wood betony, the Luzula Forsteri, Borreri, and pilosa, (three not very common species of the wood rush) and the spurge (*Euphorbia amygdaloides*), as almost everywhere exceedingly abundant. The Caper Spurge (*Euphorbia lathyris*), has been found recently near Welsh Bicknor, and the only locality in Britain for the Euphorbia Stricta is near Tintern. The wood laurel (*Daphne Laureola*), occurs frequently. The bearsfoot (*Helleborus viridis*), with its handsome digitate leaves and green flowers, is found in one locality only. The setterwort (*Helleborns fœtidus*) grows in two or three places, some very fine plants of which have been seen this year. The lily of the valley (*Convallaria majalis*), and the Solomon's seal (*Polygonatum multiflorum*), in two or three places only. The herb Paris, plentiful in a few localities, but rather shy. The barberry (*Berberis vulgaris*), and the box also scarce. The columbine (*Aquilegia vulgaris*) is another interesting plant, and one of the commonest of all is the traveller's joy or honesty (*Clematis vitalba*), covering the hedges with its feathery masses. The two periwinkles (*vinca major* and *minor*), several of the *Orobanchæ* or broom-rapes, with their brown, weedy, withered-looking flowers, and parasitical on the roots of hazel, the singular tooth-wort (*Lathræa squamaria*), and under the beech trees occasionally in autumn the yellow bird's nest (*Monotropa hypopitys*).

The lesser winter green *(Pyrola minor)*, very shy but very graceful, and near it the pretty little *Rubus saxatilis* are to be found at the Wynd Cliff, as well as *Sedum rupestre* and *Saxifraga hypnoides*. The wild lettuce *(Lactuca virosa)* grows on Doward, as well as the small teasel or shepherd's rod *(Dipsacus pilosus)*.

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We have also a fair sprinkling of orchids. The fly, frog, and bee orchids are abundant in some years, while in others scarcely to be met with.

The butterfly and bird's nest orchids are generally very plentiful. The true *O. Bifolia*, however, is only found in a place or two, as likewise the pretty little lady's tresses *(Spiranthes autumnalis)*. The *Helleborines*, *Cephalanthera*, *ensifolia*, and *grandiflora*, and *Epipactis ovalis* are quite rare, and found only occasionally.

As an illustration of the curious way in which orchidaceous plants spring up suddenly in fresh spots, we may mention the finding near Bromyard a few years ago of the *Epipogon aphyllum*, which has never before or since been gathered in Britain.

In addition to the above we may include the aromatic *Orchis conopsea*, the rare *pyramidalis* with its beautiful close crimson spike, also *Orchis fusca*, *ustulata*, and *latifolia*. One other scarce plant may be noticed as growing very sparingly in one spot, on a very thick part of the woods, the *Cynoglossom montanum* or wood hound's-tongue, the other species being particularly common.

About 27 species of ferns (not including the minor varieties,) are to be found round Ross, that is, if we extend the boundary as far as the Black Mountain, where the *Asplenium viride* and *Aspidium Thelypteris* are both found.

The Royal fern, *Osmunda regalis*, however, can scarcely be said to grow now, as it appears to have become extinct, one lady in her zeal (as it is reported) having sent a wagon to transplant it to her fernery.

Fragilis was plentiful a few years since on the Coldwell Rock, but is now nearly gone. *Robertianum* or *Calcareum*, the limestone polypody, is still abundant, although a very good locality has been temporarily destroyed by railway quarrying.

The sweet scented *Lastrea œmula* has hitherto only been found very scantily growing under the base of a rock. The adder's tongue and moon wort both grow near us. The "oak" fern is plentiful on the borders of the Forest of Dean, but the "beech" fern is much more rare. Perhaps in few places do the "hart's" tongue and other commoner ferns grow in greater profusion or strength than in our woods. Several rare grasses are met with such as the *Bromus erectus*, *Melica nutans*, *Hordeum salvaticum*, *Alopecurus fulvus*, *Bromus secalinus* and *velutinus*, *Brachypodium pinnatum*, *Calamagrostis Epigeios* or the wood smallreed, &c., &c. The "drunken darnel," as it used to be called *(Lolium temulentum)*, the only poisonous grass in England, sometimes comes up in the rectory glebe near Ross.

We have also the *Gagea lutea*, or yellow star of Bethlehem, apparently wild; the other species *Ornithogalum nutans umbellatum* being apparently garden escapes. The evergreen *alkanet (Anchusa sempervirens)* with its intensely blue flowers, and the Deptford pink *(Dianthus armeria)*, are both good plants. Then of plants used for medical purposes, in addition to some before named, we have the *Digitalis* in profusion. The deadly nightshade *(Atropa belladonna)* with its potato-like haulm, its dull purple flowers and black currant-like fruit.

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The Elecampane *(Inula Helenium)* with its soft downy leaves, two feet long, and its large sunflower blossoms. The Henbane *(Hyoscyamus niger)* scarce and uncertain in its growth. The mother's wort, or as it is called by the villagers "the Hand of God" *(Leonurus Cardiaca)* a plant held in great veneration by some. The *colchicum*, *valerian*, and *gentian* and many others. The *valeriana rubra* is very fine on the Chepstow rocks, where a white variety also occurs.

And now, as we have pretty well explored the woods, let us take a peep at some of the projecting ledges of limestone rock, and we shall find in very early spring the *Carex clandestina*, *montana*, and *digitata*, and the *Hutchinsia petræa* or rock cress, all very scarce plants. Later on, the pretty little dropwort *(Spiræa filipendula)*, the rock rose *(Cistus Helianthemum)* and a profusion of *Geranium sanguineum*, sometimes quite a splendid sight as also the horse-shoe vetch *(Hippocrepis comosa)*.

Water plants are perhaps not quite so numerous as some other kinds, from the comparative absence of bogs and wet places. We can boast, however, of a pretty large variety. The arrow head, and flowering rush, are both found in the Wye, and on its banks.

The celery *(Apium graveolens)*, meadow rue *(Thalictrum flavum)*, the purple loose strife *(Lythrum salicaria)*, the yellow ditto *(Lysimachia vulgaris)*, the large *Campanula latifolia;* also *C. patula* and *Rapunculus*.

We have also the bog bean, bog asphodel, sun dews, butter wort, mare's tail *(Hippuris vulgaris)*, cotton grass (three species), equisetum, and chara, &c. Also a considerable number of maritime plants on the tidal banks of the river, which are scarcely worth mentioning. We must not, however, forget one relic of monkish times, found in the meadows near Tintern Abbey. The purple goat's beard, or "Go to bed at noon" *(Tragopogon porrifolius)*, so called from its shutting up after mid-day.

Without attempting to give a list of the wild birds, which find their home in these woods and rocks, I may mention that although the railway and game-keepers have frightened away or destroyed many of the rarer species, a pair of ravens still occasionally appear. They used to build on top of a precipitous rock. Two years ago I saw at one time no less than five large buzzards sailing in circles at a great height, uttering their loud and peculiar scream. The salmon kite, however, is now very rarely seen. Herons, king-fishers, and nightingales still however frequent the valley. The entomologist will find a rich harvest of rare butterflies, moths, beetles, and other insects. Last year a cottager was somewhat alarmed by the appearance of a stag-beetle, and thought he had discovered the true 'Colorado."

About three-quarters of a mile down the river from New Weir and Symonds Yat Station, on the right bank of the river, is the "Dripping Well," possessing petrifying properties similar to that at Knaresborough, in Yorkshire—there called the "Dropping Well." Here a considerable body of water is constantly trickling

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over the rocks from a large bog at the top of them, where in summer adders may be frequently seen basking in the sun and coiled up. The water, holding a large quantity of carbonate of lime in solution, yields a tufaceous deposit, encrusting objects which come in contact with it. The open ground near the river just opposite is called "Slaughter," probably from some bloody struggle which had taken place there in former times. The occasion of this conflict has been attributed by tradition—for there is no authentic history—to the time when the Roman general Ostorious Scapula, having been appointed by the Emperor Claudius, A.D. 50, to effect the conquest of Britain, attacked the army of the British General Caractacus who is believed to have posted himself on Little Doward. A gigantic skeleton, discovered about 200 years ago in the neighbourhood, was thought to be that of a man 11 or 12 feet high (possibly one of Vortigern's officers), but it was more probably the remains of some fossil animal. Vortigern retreated into Wales after the battle at Amesbury, in Wiltshire, in A.D. 469, and it is thought took refuge at the Doward before going into Radnorshire, where he was burned in his castle. But there is no doubt that this neighbourhood was the scene of many a desperate encounter between the Saxons and the Welsh, and even so late as 1640 property was very insecure, and great losses were sustained by the incursions of predatory marauders. The Roman station Blestium is supposed to be Monmouth, and Ariconium to have been about two miles from Ross. A large number of natural caves or caverns occur in places on both sides of the river, in some cases 200 to 300 feet above the present level of the water; two or three on the left bank, of which the largest and most curious is "The Diblin," although but little visited, from its isolated and rocky situation, is entered by a small opening four feet wide by two feet high. After a short scramble on hands and knees you reach a cavern in the deepest part of which you can just stand upright. Two openings lead inwards and downwards, but unite at a distance of from 30 to 40 yards. From this point you may wander for an hour or more through small passages and some considerable caverns beautifully ornamented by stalactite and stalagmite. One is called the Devil's Chapel. Another cavern has recently been opened out by a mine shaft; this has an arched roof about thirty feet high; and is about one hundred feet long, by fifty feet wide. But the most famous is of course that which has long been known as King Arthur's cave or hall. In reference to this cave, it is reported that the rhinoceros bones were so plentiful that a neighbouring farmer carted them out to manure his land, and thus, it is said, led to the explorations and discoveries which have since been made by the Rev. W. S. Symonds, M.A., of Pendock, and other gentlemen. In clearing out the rubbish on the upper surface, they found portions of two human skeletons, and pottery of the Roman-British period. The top mould was evidently modern, but below was a stalagmite floor, so thick and hard that gunpowder had to be used. In a layer of earth below this, were found bones of the black bear and beaver. Beneath this was a second bed of stalagmite, and below this again fossilized bones of extinct animals, a mammoth's tooth, and bones of the woolly rhinoceros, cave lion, gigantic Irish elk, horse bison, cave bear, and very

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numerous bones of hyenas. Flint flakes and chips were also found, and Mr. Symonds remarks: "In that lower cave are associated the remains of ancient men and extinct mammalia; and what with the evidence of the old river bed and the stalagmite, I doubt if there be better authenticated evidences of the antiquity of man in the records of cave history." The state of preservation in which many of the remains exist is marvellous—such as the marks of the hyena's teeth or the reindeer's horns. There is a very interesting collection of these relics of the past to be seen in the Gloucester Museum. Whether the hills have been upheaved since the hyenas dragged their prey into these their dens, or whether the Wye has cut its course through the rocks by gradual friction, I will leave to geologists to decide. An ingenious calculation was once made by an eminent engineer that the Wye had taken eleven million of years to form its present channel. There are two clearly marked camps and one strong military position in the district. Perhaps the British camp on Little Doward Hill may be the most interesting from its commanding position and clearly marked character, in shape being an irregular oval, and adjoining and extending into a quadrangle. The area of the camp within the vallum being somewhat more than 20 acres. On the north east and north west is a double vallum, protected in one place by a single rampart lower down the hill. On three sides no artificial defence was necessary, as the whole occupies the summit of a steep cliff. There is also another camp near Symond's Yat where extensive fortification works are visible. There also, it is asserted, Offa's dyke is to be clearly traced. The Buckstone visible from many points, is also an interesting spot to visit. As a rocking stone it resembles the Logan-stone in Cornwall, and consists of a mass of old red conglomerate about 19ft. long; breadth, 13ft.; circumference, 52ft.; height, 12ft. or 13ft. A rock basin in the top, and a rude arch in the eastern corner has given rise to curious speculations as to Druidical usage. From it is perhaps one of the most extensive woodland views in England.

I must now apologise for this fragmentary and incomplete sketch, conscious that I have exhausted your patience rather than my subject.

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Woolhope Naturalists' Field Club.

THE LADIES' DAY,

JULY 18TH, 1878.

FOREST OF DEAN.

Pretty were the sight
If our old halls could change their sex and flaunt
With prudes for proctors, dowagers for deans,
And sweet girl-graduates in their golden hair.
Tennyson.

AND pretty was the sight when a goodly array of lady-graduates in science joined the members of the Woolhope Club on Thursday, the 18th July, for an excursion to the ancient Forest of Dean. Special trains had been provided, clouds tempered the burning rays of the sun, a gentle breeze made itself pleasurably felt, and all went well, as it should do on a "Ladies' Day."

Let us take up the tale at Lydbrook Junction, on the very borders of the Forest itself, situate in that district of Gloucestershire "twixt the Severn and the Wye," so long renowned for its interest and beauty. The special train gradually left Wye Side, and with just a peep at the woods of Symonds Yat and the Coldwell Rocks, wound up a steep ascent by a wide curve, and crossed the vale of Lydbrook by a viaduct so lofty that the scattered houses and busy population of Upper Lydbrook, were quite looked down upon. Here the true forest was entered,

Ye sylvan shades, ye bowery thickets, hail!

and the ride for about four miles from Lydbrook to the Speech house Station was exceedingly rich and beautiful. Several published accounts of Gloucestershire have described the Forest of Dean as being in great part denuded of the timber that once covered it: around Coleford and in the southern and eastern parts this is the case, but for all the distance explored by the club on the present occasion the native luxuriance of the Forest has been fortunately preserved. Hill succeeded hill, valley followed valley, far as the eye could reach, and all were densely covered with oak timber some three-parts grown, and as these were seen from the high level of the railway the sea of foliage was wonderfully refreshing. The sun obligingly shone now and again to light up the brows of distant hills, and show more clearly their varied outline and the great extent of the Forest verdure. It is indeed a sylvan ride of unusual interest and beauty.

At the "Speech House Station" the visitors alighted, and took their way for the inn denominated the "Speech House," which occupies a central position in the forest some half mile from the station. The way was steep and the road was dusty, but those who knew of it took the shady path under the trees by the side.

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The whimseys of a coal mine soon appeared on its bank of *débris*, and the black smoke as if from a volcano swept over the landscape. The programme had offered the temptation of a descent into a coal mine, but though some bright sparkling eyes bore witness to the readiness for the adventure, there was some hesitation as to the dirt, and when some miners came up the shaft, the practical necessity of sticking a lighted candle in front of their hats became evident, and the fair visitors decided to leave the carboniferous shades below unexplored, and contented themselves with looking down the shaft.

A little higher up the hill on the right, passing through paths knee-deep in fern, a large space of open boggy ground was found containing some rare and interesting plants. The pretty little Bog Pimpernel (*Anagallis tenella*) covered the ground with its delicate pink striped blossoms and rosy tipped buds—

> Of fairer form and brighter hue
> Than many a flower that drinks the dew
> Amid the garden's brilliant show.

The botanists went down on their knees with much enthusiasm to get good specimens, until one fair matronly student in science—a dean of the new order she should be—thought that kneeling on damp, boggy ground might possibly entail a visit to Buxton. The slender *Scutellaria minor*, or lesser Scull-cap, was the next discovered plant; then the fresh pink blossoms of *Pedicularis sylvatica* were gathered; and a sharp-eyed botanist detected the tiny flower of the marsh Pennywort, *Hydrocotyle vulgaris*, whose round pale green leaves sprinkled the whole surface of the ground.

The next plants which excited enthusiasm were the marsh St. John's Wort, *Hypericum elodes*, which is quite a rarity within the bounds of civilisation; the trailing St. John's Wort, *H. humifusum*; and the beautiful bright orange flowered upright St. John's Wort, *H. pulchrum*. Not to mention the divine virtue of driving away devils, all sorts of medicinal virtues have been attributed to the St. John's Worts, from time immemorial, and precious balsams and rare unguents were made from them; one of them, *H. Androsæmum*, not uncommon in Herefordshire hedgerows and gardens, is called "Tutsans" from the French "*toute-saine*," or "Heal-all," but in our more prosaic modern terms it hath been cynically said forsooth,

> The herb St. John
> Doth neither good nor hurt; but that's all one;
> If they but conceive it doth, it doth!

Many superstitions too are connected with them; one of which at least deserves mention here. In Lower Saxony if maidens gather St. John's Wort on Midsummer night and hang it up in their bed-chambers, the fresh or withered appearance of the plant in the morning will show whether they are to become brides in the ensuing year—an idea which is thus happily translated from the German—

> The young maid stole through the cottage door,
> And blushed as she caught *the plant of power*.
>
> Thou silver glow-worm, Oh! lend me thy light!
> I must gather the mystic St. John's Wort to night;
> The wonderful herb whose leaf will decide,
> If the coming year shall see me a bride!

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The great botanical "find" of the day, however, from its delicacy and gracefulness, was the Ivy-leaved Bell-flower, *Campanula hederacea*, which is lovely even to the commonest observer, and which, whenever it is met with, recalls a host of past rambles in secluded spots of Alpine beauty which it so especially affects. The common round-leaved Blue Bell is happily as common and conspicuous as it is pretty. It may be open to question, whether any sprays of it, seen to-day peeping from behind the bushes, comported themselves with our "Sweet Girl graduates," as Scott describes it to have done under the fairy footsteps of Ellen—

> E'en the light Hare-bell raised its head,
> Elastic from her airy tread.

The Ivy-leaved Bell-flower is so much smaller that its attractions must be sought for. Many botanists and poets have shown a fanciful leaning in favour of some special plant, and Mr. Edwin Lees, in his very interesting work, "The Botanical Looker-out," says for himself "I think from its delicate beauty and its association in my mind with *oases of bright thought*, I should fix upon the Ivy-leaved Bell-flower" (p. 151). The veteran botanist himself took the lead to-day, and it was highly appropriate that his favourite flower should be in attendance.

The whistle had been frantically blowing for some time before the delighted botanists could be persuaded to quit this flowery oasis, at length, however, passing up through groups of hollies, crab-trees, thorns, oaks, and beech trees, the Speech House was soon reached and the welcome given to those members who arrived from other directions. The president of the Club, the Rev. H. W. Phillott, was unfortunately prevented from attending, but his place was very ably supplied by the Rev. R. H. Cobbold. Under his direction, measure in hand, the whole party plunged within the sylvan covert, which is happily here devoid of underwood, and admits of easy, enjoyable exploration. A large beech tree, seen from the grassy terrace, was first approached: it gave the girth of 16 feet at five feet from the ground, and others afterwards met with measured 12 ft. 4 in., and 14 ft. 2 in. One that had just fallen girthed 14 ft. 6 in., and as the saw had cut its way smoothly its age was pretty nearly ascertained, by counting the annular rings of growth in the wood; 123 annular rings were counted, but as the bole was a little shaky in its centre, and a little imperfect at the margin, another 20 years should be added, making its approximate age 143 years. The largest beech tree in the forest stands about half-a-mile east of the Speech House, and a noble tree it is. It measured at five feet from the ground 17 ft. 4 in. in the circumference, and its height was roughly estimated at from 90 to 100 feet. The High Beeches, some two or three miles distant, are still more lofty, and two of them are very grand, but the largest of them only gave a circumference of 16 feet.

One chief feature of the forest round the Speech House, and it is one so peculiar as to deserve especial notice, is the existence of numerous very aged holly-trees. Useless as timber they have been left in the wood to assume the grotesque appearance of extreme age. Some are hollow, some are very tall, some are embowered in ivy, many consist of several stems, from the death possibly of the one original trunk, and almost all of them are very picturesque, with curiously contorted

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branches. Another old holly presented a singular aspect, from the determined way in which its limbs, centuries old, have encircled and compressed a thorn tree. —If trees can ever be vicious this one certainly is.—The thorn all the same is tough and bears its fate bravely. Mr. Lees could not resist sketching this one, and another whose five stems gave a joint circumference of 14 feet, and he descanted meanwhile with zeal on the very slow growth of the holly, and its great age and venerable appearance. "These trees perhaps beheld the Saxon and Danish invaders in Britain" said he, "and certainly they must be considered coeval with the conquest." However this may be, deponent sayeth not. It was very delightful to rest on the fantastic mossy roots that surrounded so many of the old trees, and to wander from one veteran sylvan to another, noticing their umbrageous peculiarities and divarications, in divine oblivion to all low-carking cares. Some of the oaks were old and picturesque, but none of very large size have escaped the fell-stroke of the woodman's axe in search of valuable timber. Here in this sequestered scene, many might exclaim with Tennyson,

> "O flourish hidden deep in fern,
> Old oak, I love thee well,
> A thousand thanks for what I learn
> And what remains to tell."

The bole of one oak presented a series of fine specimens of the fungus, *Polyporus dryadeus*, exuding large drops of native ketchup, which were carefully collected for microscopic examination. A small specimen of the *Hygrophorus coccineus* was gathered by one fair hand. The poisonous *Scleroderma vulgare* was met with; and these with a half-eaten *Boletus sub-tomentosus* were all the funguses collected during the day. Fungus life requires more moisture than we have recently had.

A long morning was most agreeably passed amidst the delicious forest shades which all present are not likely soon to forget—

> So variously seemed all things wrought,
> 'Twas marvel how the mind was brought
> To anchor by one gloomy thought.

Thoughts did intrude, but they were not gloomy. The inner man has claims that will be urged even at the most poetical times, and, as Miss Edgeworth says in one of her tales, "even at the most exciting period of mental thought dinner must be placed on the table." All were ready to answer the summons now, the Dryads were left, nor could the members be induced to wait at the door of the Speech House even for a few minutes that they might appear in the photograph that was being taken by one of the visitors.

This will be the favourable opportunity to give the names of those present, since there was no fear of absentees—Rev. R. H. Cobbold (who was President for the day), Mrs. Cobbold, and Miss Thorn; Mr. Edwin Lees, F.L.S., F.G.S., Vice-President of the Worcester and Malvern Field Clubs; Rev. W. L. Bevan, Mr. Swinburne (Vice-President), Mrs. and Miss Swinburne, and the Rev. W. Kearsey Thomas; Mr. Timothy Curley, F.G.S., &c.; Mrs. Oldham, Mr. Charles Oldham, Miss Oldham, Miss Wakefield, Miss Edith Symonds, and Miss Stillingfleet, Captain

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Mayne Reid; Mr. and Mrs. E. Colt-Williams, and Miss Timberlake; Rev. C. J. Westropp; Mrs. Beddoe, Mr. C. B. Beddoe, and Miss Marion Beddoe; Dr. Bull, Mr. H. P. Bull, Miss Bull, and Miss Evelyn Bull; Mr. W. C. Bull; Miss Ellis; Rev. E. and Mrs. Cunningham, Mr. Charles Fortey, Miss and Miss Margaret du Buisson, Mr. T. C. Paris, Rev. Percy Burd and Mrs. Burd, Rev. W. D. V. Duncombe, Mr. John Morris, Miss Morris, and Mrs. and Miss Blinkhorn; Mr. Joseph Greaves, Rev. T. M. and Mrs. Beavan; Rev. C. H. and Mrs. Bulmer and Miss Bulmer; Mr. Cockrem, Miss and Miss F. Cockrem, and Miss Morris; Rev. W. R. Shepherd, Rev. H. B. D. Marshall and Mrs. Marshall, Rev. G. M. and Mrs. Metcalfe, Mr. W. A. Armitage and Mrs. Eckley Armitage and Miss Brown, Mr. Theophilus Lane (secretary) and Mrs. Lane.

The dinner took place in the Verderer's room. It was rather a scramble, and the excellent waiting had to be done by the members, whilst not a few of the visitors had to practise it in a negative sense. The room indeed was rather full, but there was enough for all, so things righted themselves in the end. After dinner an excellent paper was read by Mr. Lees, entitled "Cursory Notes on the Forest of Dean and some of the objects within it." It was listened to with much interest, and, on the motion of Dr. Bull, the thanks of the Club were unanimously given to Mr. Lees, not only for the present paper, but for the generous kindness with which he had always placed his services at the disposal of the Woolhope Club.

A pleasant adjournment was then made to the beautiful green terrace on the western front of the inn, and here Captain Mayne Reid gave a very interesting account of the "Chinampas, or Floating Gardens of Mexico." The paper was written in that terse descriptive style which has rendered the reader's name a household word through the kingdom. The President proposed a vote of thanks to Captain Mayne Reid for his kindness in preparing it for the meeting, which was most cordially granted.

An hour still remained for the cup of coffee, and a leisurely walk down the hill to the station; but it is the fashion of the age to hurry off to a station at the last moment, and so the way down the dusty road, in the full blaze of a western sun, was the only oppresive incident of the day to those who unwisely followed the fashion. The botanists knew better; they turned again through the trees to the many-flowered bog, and dallying with the ferns below, the fragrant *Asplenium Oreopteris* in particular, made the descent both shady and pleasant. Again the four miles of lovely scenery to Lydbrook were passed through, varied by full sunshine, and the travellers reached Hereford by 7.50 p.m., "in time for the evening trains in all directions," as the programme stated.

The business of the Club was transacted *en route*. What it was, what new members were elected, and what fresh ones proposed, is all written no doubt in the archives of the Club. It scarcely needs to add that "The Ladies' Day" in the Forest of Dean passes pleasantly into history, to be noted hereafter, as a red letter day of the Club.

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CURSORY NOTES ON THE FOREST OF DEAN AND SOME OF THE OBJECTS WITHIN IT.

BY EDWIN LEES, F.L.S., F.G.S., VICE-PRESIDENT OF THE MALVERN AND WORCESTERSHIRE NATURALISTS' CLUBS.

What can be shortly said about the ancient Forest of Dean may be almost comprised in what Mr. Pepys puts in his gossiping Diary under date of August, 1662, when he says that he had a "good discourse" with Sir John Winter, "a very worthy man, most of which was concerning the Forest of Dean, and the timber there, and iron works, with their great antiquity; and the vast heaps of cinders which they find, and are now of great value, being necessary for the making of iron at this day; and without which they cannot work."

The general idea of a forest is that of ground densely covered by majestic trees, but whatever may have been its aspect in pre-historic times, it has been so despoiled in various ways that in the present day Dean Forest is only a forest in name, but few extensive patches of wood occur to charm the eye, scarcely any old trees of extraordinary size remain, while wastes of bare heathy ground with scattered coal and ironworks are the more apparent features of this tract of country. Where ground has been preserved for plantations they consist only of young trees.

The woody region appears to most advantage and attractive to a lover of sylvan scenery who, crossing the river Wye from Whitchurch, either ascends Symond's Yat, and from thence looks down upon the Coldwell Rocks, and the woods that surround them, or proceeds by a lower route through the sylvan coverts that intervene between Symond's Yat and Coleford. Here on a fervid summer day he might be inclined to say with one of our poets (Gay)—

> O lead me, guard me from the sultry hours,
> Hide me, ye forests, in your closest bowers,
> Where the tall oak his spreading arms entwines,
> And with the beech a mutual shade combines.

Dean Forest had indeed the closest bowers throughout a wide extent when Drayton described it as—

> The queen of Forests all that west of Severn lie;
> Her broad and bushy top Dean noddeth up so high,
> The lesser are not seen she is so tall and large.

But this is a picture not now to be realised, and we must be satisfied that we are on forest ground, if the covert is not so dense as it formerly was; though near the Speech-house, and between that and the Railway-station, real forest scenery exists in pristine grandeur; and the size and grotesque form of the holly trees cannot be surpassed anywhere in Britain. Many of the hawthorns, too, are evidently of great age, and these as well as the hollies may have stood here in Saxon times. Several beech trees present a magnificent spread of branches, with boles of large girth, but these cannot be near so old as the extraordinary hollies.

It is clear, however, that in not far distant times a greater extent of real forest scenery might be contemplated than now exists, for it is stated that during

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the so-called Commonwealth 40,000 trees were cut down by order of the House of Commons; while after this Pepys mentions that "We have letters from the Forest of Dean that above a thousand oaks and as many beeches are blown down in one walk there." Such was the devastation made by this fearful gale that Fosbrooke has recorded from some authority that the roads were impassable till the trees blown down had been cut away, while in some great orchards it was possible to go from one end to the other without touching the ground. As if windy outrage was not enough to destroy all sylvan scenery and leafy covert, a grant of the timber in the Forest was made on certain conditions by the unthrifty Charles II. to Sir John Winter, mentioned by Pepys as "a man of fine parts," and these he made use of by proceeding under his patent to cut up the Forest almost entirely. The spoil he was making of the timber, however, gave such dissatisfaction to the neighbourhood that the people's complaints reached the House of Commons, and Sir Charles Harford reported to the House "that Sir John Winter had 500 cutters of wood employed in the Dean Forest, and that all the timber would be destroyed if care should not be speedily taken to prevent it." A later report affirmed that out of 30,233 trees in a part of the Forest where the said Sir John Winter had been allowed control he had only left 200 trees standing. An Act of Parliament (20th of Charles II.) was therefore passed for replanting the forest, and 11,000 acres were enclosed accordingly, but so remiss were the forest officials, and spoliators so numerous and disregarded, that Christopher Bond, appointed conservator and supervisor of the Forest, had to report to the Treasury in 1736 that "The regular Courts had been discontinued and offenders left unpunished; the officers of inheritance had grown remiss and negligent, so that some enclosures and those of only a few acres of the 11,000 had been kept up, and these not carefully repaired; a great number of cottages were erected upon the borders of the forest, the inhabitants whereof lived by rapine and theft; that there were besides many other offences committed—trespasses in the fence month and winter training, and in the enclosures; keeping hogs, sheep, goats, and geese, being uncommendable animals, in the Forest; cutting and burning the nether vert, furze and fern; gathering and taking away the crabs, acorns and mast, and other purprestures and offences; carrying away such timber trees as were covertly cut down in the night time, by which practice several hundred fine oaks were yearly destroyed, and the growths of others prevented; and that it was feared that some of the inferior officers of the Forest finding offenders to go in with impunity were not only grown negligent, but also connived at, if not partook in, the spoil daily committed."

This is a pretty picture of the state of a royal forest, and it accounts for the absence of many fine or remarkable trees; indeed, except a few grand but battered beeches, and some hollies not likely to be disturbed, and unquestionably of great age, near the Speech House, I only know two oaks that may be deemed remarkable for their size and age.

One of these on the top of the Long Hill, near the Coleford and Mitcheldean road, is called, "Jack of the Yat," and is more than 18 feet in girth; but the great

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oak at Newland far exceeds this in size, being nearly 60 feet in girth at the base, and is probably above a thousand years old. Mr. Nicholls, in mentioning the present aspect of Dean Forest, says there are five very large beech trees growing about two miles from Coleford on the road to Mitcheldean, and reports the finest of all the beeches in the forest to be near the entrance to Whitemead Park, and measuring 17 feet in girth at six feet from the ground.

The plantations now preserved, all belonging to the present century, and intended in time to yield profitable timber, are now under careful supervision, Sir James Campbell having been appointed the chief verderer.

Nine-tenths of the present trees are oaks, the rest are Spanish chestnuts, Scotch fir, larch, spruce fir, beech, with a few elms, sycamores, and horse chestnuts. Birches grow spontaneously in most parts of the forest, and holly in several places—perhaps the oldest forest denizens.

Dean or den is a Celtic word signifying a wooded region, and with a prefix it appears as the name of a vast tract of forest country in Belgium, the Ardennes, and there was the Forest of Arden in Warwickshire. All monarchs and chieftains from the time of Nimrod appear to have been great hunters or devoted to field sports, and hence they reserved the most extensive woods for sporting ground, and exacted laws and appointed officers for the preservation of the game, and to assist in its capture when they hunted in these appropriate places. The Forest of Dean, situated between the Severn and the Wye, has always been a royal forest since the reign of Edward the Confessor, and probably long before. William the Conqueror of course seized upon the forest, and is recorded to have hunted there, and in the reign of his son, Henry I., the castle of St. Briavel's was built and a court established there, the constables of the Castle being constituted Wardens of the Forest.

Mining for iron ore was carried on even in the ancient British times, and the customs and franchises claimed by the free miners and still enjoyed by them, are declared in the book of "The Miners' Laws and Privileges," a manuscript of the date of Edward I.'s reign, to have been granted "tyme out of mynde." But to go into the particulars of these privileges would occupy too much time, and be not sufficiently interesting.

Traces of the ancient iron works in the forest are evident in abandoned caverns and deep excavations, some of which are open to-day, and bear the curious name of Scowles.* On my first visit to the Forest of Dean a friend, residing near Coleford, directed my attention to the remarkable excavations called the Scowles, at Bream, about two miles from Lydney. The place being hidden by bushes is not easily found by a stranger, and on making enquiries of persons I met on the road the term Scowles did not seem familar to them. At last, addressing some colliers, one of them said, "He must mean the devil's chapel," and this proved to be the fact, and so I was guided to the devil's oratory. These Scowles

*A corruption of the British *Ceawl*, signifying a cavern or excavation.

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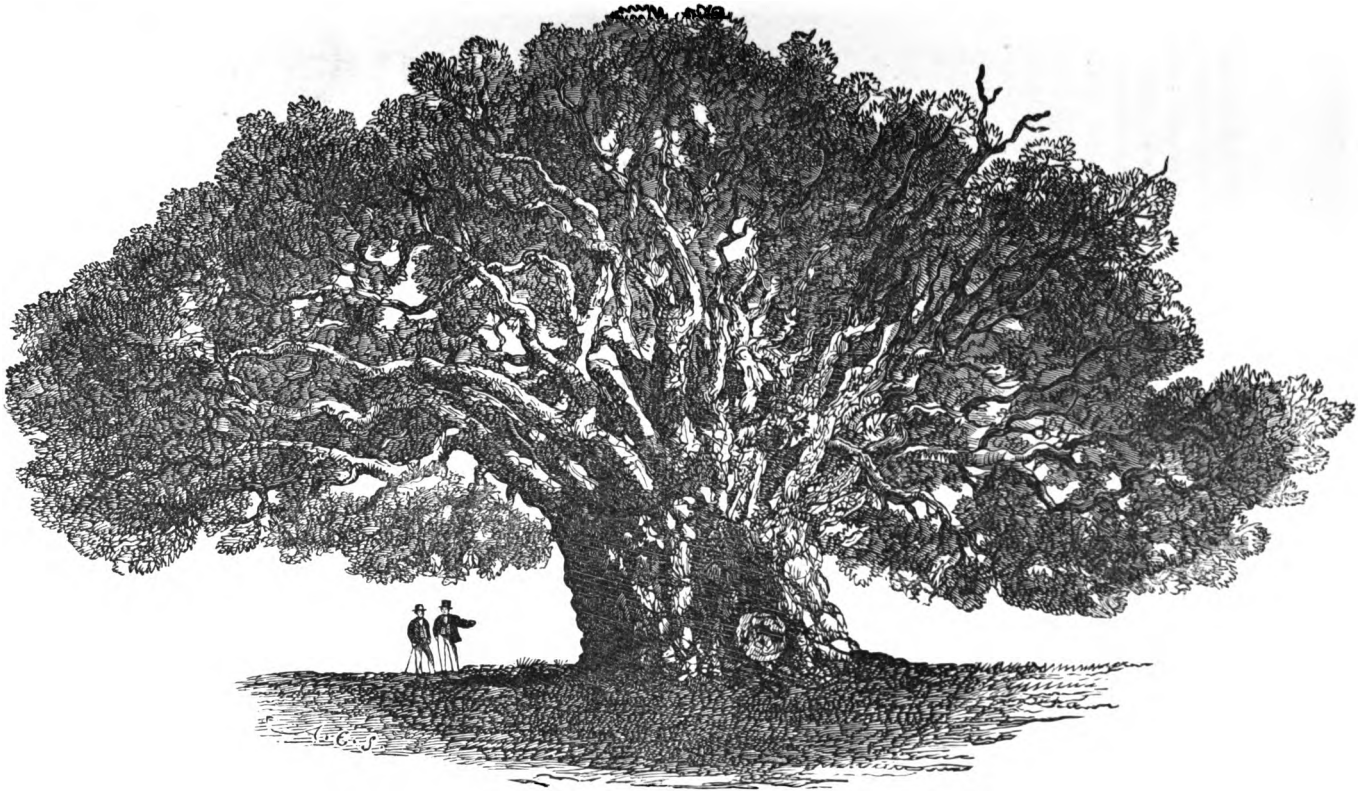

THE] NEWLAND OAK, FOREST OF DEAN.

From an electrotype supplied by "The Gardeners' Chronicle."

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I found to be deep but narrow excavations among rugged rocks, winding about according as the old miners had followed the vein and churns of ore, deepening as they went, and leaving these catacomb-like passages, which in the lapse of time had got covered with vegetation, and crested with beeches or the dark verdure of shattered yews, making a singular and romantic appearance. The rocks on either side of these narrow gullies are nearly or quite perpendicular, and in some places a shadowy gloom oppresses the explorer. In one part of this demoniacal chapel is a lofty rock called the devil's pulpit, where ancient superstition supposed the enemy of mankind to show his horns at certain times, and direct the operations of a crowd of demons and witches there assembled. These labyrinths were certainly the toil of many years, and thus abandoned are well adapted to superstitious imaginings and wild ideas, especially when contemplated on a cloudy evening, or by moonlight, when the gloomy winding aisles are only half revealed, and a night wind moans among the flapping boughs above, the still solitude only otherwise disturbed by the shrill cry of some startled ill-omened bird. (Here was shown a sketch of the devil's chapel). The roots of trees run down these isolated rocks in a most remarkable manner, and on a gloomy day, when the dark branches of the crested trees shut out the light of heaven, a scene depicted by Hood in one of his poems may be realised to an imaginative observer—

> It was a wild and solitary glen,
> Made gloomy by vast yews with foliage dark,
> Whose upturn'd roots like bones of buried men
> Push'd through the rotten soil for fear's remark;
> A hundred horrid stems jagged and sark,
> Struggled with twisted arms in hideous fray."

There is an excavation of passages more open to the day at Clearwell, called the "Pleasure Rocks," resorted to for hiding among by the people around on holiday times, and here I noticed, in these sheltered crannies, ferns of more luxuriant growth than I ever met with elsewhere, most elegant and beautiful. Some of the fronds were a yard in length.

From Roman coins having been found in the vicinity of these excavations, which occur in several parts of the forest, and among abandoned heaps of cinders, it has been inferred that the Romans when in Britain worked the mines here for the iron they wanted; but as scythes were affixed to the war-cars of the ancient Britons before the Roman invasion, it is probable that British miners already here were continued to be employed by the Roman officers stationed at Glevum (now Gloucester), and they would pay the workmen in Roman coin, which perhaps there was some difficulty in exchanging in a rude uncultivated district, or they might hide them for security.

That the Britons, or some tribe of the Silures, had a vocation here in Druidic times is evident from the pre-historic relics yet remaining within the confines of the forest, the most remarkable of which is a Logan, now known as the Buck-stone, a comparatively modern name given it from some hunted buck having—possibly a daring leap—mounted the stone to escape its pursuers. These Logan, or rocking-stones, are believed to have been used by the Druids, either for judicial or

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oracular purposes, only the initiated knowing how to make the stone vibrate. The Buckstone is formed of the old red conglomerate on which it rests, and whether entirely artificial, or only partly so, from having originally been a fallen mass from the cliffs above, and by Druidic manipulation fashioned as it now appears, it well deserves the observation of all who are interested in the relics and observances of past ages, and it is fortunate to have escaped destruction. Near the Buckstone is a rudely hollowed stone, forming one of those rock basins that were used for ablution by the Druids in their ceremonial rites, and these sacred remains stand surrounded by oaks, a tree which they particularly honoured. In the same vicinity are the "Broad-stones," where still exists a sacred well, and a thoughtful visitor might in imagination see the mystic celebrant dip his hands in the pure water sent from heaven remaining in the hollow of the stone, and descend the nine steps that still remain to the overhanging logan, which was made to tremble before the eyes of the judges on their stony seats as the chief Druid solemnly raised his hands.

Besides these relics of Celtic superstition, a large mass of gritstone ten feet high, called "the Long-stone," stands in a field by the roadside from Bream to St. Briavels, and there is another of the same character on the north-east side of the Staunton and Coleford road. Their weather-worn appearance proves that centuries have made their corroding marks upon them.

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Woolhope Naturalists' Field Club.

THE fourth field meeting of the Woolhope Club for the present year was held at Leominster, on Thursday, 22nd August, for an exploration of the ancient British Camp of Croft Ambery. Amongst those present were the Rev. H. W. Phillott, M.A. (President), Mr. H. C. Beddoe, Mr. H. L. Brühl, Dr. Chapman, Rev. G. H. Clay, Mr. T. Curley, Rev. F. T. Havergal, Mr. J. Hullah, Mr. T. C. Paris, Mr. W. A. Swinburne, Mr. Theo. Lane, (Secretary).

The members left Barr's Court Station at 9.15 a.m., when on reaching Leominster they found a carriage in readiness to convey them to Croft Ambery. On arriving at the Park gates, leading to Croft Castle, they were met by the Rev. J. Edwards, rector of Croft, who kindly conducted the members through the charming grounds of Croft Castle. The celebrated grove of sweet chestnut trees was visited, and the trees measured,*—and admired as they ever must and will be by lovers of trees. The church was visited and its interesting monuments examined, one of them to Sir W. Croft, killed in a skirmish during the Civil War. The avenue leading to the Castle, with its grand old oaks, fine chestnuts, and tall elms, was also noticed; and the approach to the camp made by keeping on the high ground of the park. Here the business of the club was transacted, and the members afterwards wandered about the camp examining its situation and mode of construction, admiring the splendid scenery —the celebrated triple "lover's oak," the beech and other noble trees. The return was made through the dingle, and here a variety of ferns was found, growing in great profusion and perfection. Besides the more ordinary ferns the following kinds were growing in abundance: *Asplenuim Trichomanes, Athyrium Filixfœmina, Blechnum Boreale,* and *Lastrea Oreopteris.* Here also are some magnificent larch trees, and a remarkably fine catalpa. The members were then insidiously beguiled to the rectory, where a very kind reception and a refreshing cup of tea awaited them. They then returned by carriage to Leominster, and dined at the Royal Oak. After dinner a very interesting paper was read by the President on "The Cedar Tree," and another by Mr. Swinburne on "Remarkable Trees in the neighbourhood of London," and both of them were duly acknowledged by votes of thanks from the members present.

The meeting was not numerously attended, but all who had the good fortune to be there will retain pleasant memories of a very enjoyable walk through some of the finest scenery of Herefordshire.

*For measurements see line 5 of the Post Prandial Postcript to the following paper by Mr. W. A Swinburne.

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THE CEDAR TREE.

BY THE REV. H. W. PHILLOTT, M.A.

In making a few remarks on the cedar tree of Lebanon, I must warn my friends of the Woolhope Club that I do so almost entirely from the antiquarian and historical point of view, and not from the botanical. I am no botanist in any better sense than a school-boy may be said to be a scholar, and on this ground I hope that any mistakes which I may make will be duly and distinctly pointed out, but withal treated with that indulgence which those better informed than myself can so well afford to bestow. I need hardly do more than remind my audience that the noble tree on which I am undertaking unworthily to discourse belongs to the great family of the conifers, that within that great family it is a distinguished member of the genus abies, and that within its own section of that genus it holds a patent of nobility with which not many members of it can venture to compete. Of some of those members, and also of some closely allied to it, I shall have occasion to speak by-and-bye, but first let me clear the way a little by eliminating from our view three or four of them which, though often called by the name of cedar, are by no means to be compared with the Cedar of Lebanon. I mean the Cedrus Virginiana, the Cedrus Bermudiana, and the Cedrus Lycia or Phœnicia. Of these the Cedrus Virginiana is often confounded with that of Bermuda, which is the only reason for which I mention it. The Cedrus Bermudiana produces the wood commonly called cedar, so pleasing in colour, so fragrant in scent, with which we are all familiar, both for the use to which it is sometimes applied of lining drawers in wardrobes, a purpose for which its fragrance and presumed antiseptic qualities adapt it so well, and still more for the more common application of it in clothing those sticks of plumbago which, with their wooden coverings, we call black-lead pencils. The Cedrus Lycia or Phœnicia, which I have placed together, though they are by no means identical, probably produces, one or other of them, the wood called in two leading passages of Scripture cedar-wood, and which being expressed by the same Hebrew word as the Cedar of Lebanon, has no doubt been sometimes mistaken for it, especially in less critical days than our own. But in truth neither of these four last-mentioned trees belongs to the same genus as the Cedar of Lebanon; they are all of them members of that of Junipers, and when we reflect that the Cedar of Lebanon is not a native of Palestine properly so called, still less of the desert of Arabia, in which the use of the "cedar-wood" was originally prescribed, we shall dismiss with ease any idea of community between the two trees, each bearing the name of cedar. We come, then, to the main subject of our consideration—the Cedar of Lebanon. I need hardly enlarge on the interest with which we all regard the noble tree which we know by this name, partly on account of its majestic form, its solemn and impressive outlines, its brilliant lights and sombre shadows, but also in no small degree on account of the venerable and poetical, nay, almost sacred, character which surrounds it in connection with the frequent mention of it in Holy Scripture. Talk of the Cedar of Lebanon, and the minds of many, perhaps most of us, will at once revert to the Jewish Temple and its great architect, the mighty and mysterious king, so universal in his genius, so

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comprehensive in his field of knowledge; great as an experimental student of natural history, great as a political economist, greater still as a religious and moral philosopher; whose memory is surrounded by an atmosphere in which historical truth and mythological fable are blended in a manner which, while it illustrates the character of Oriental thought, expresses also to us the extent to which that memory has penetrated the minds and imaginations of perhaps a larger number of persons than almost any other personage in history.

We all remember that in the construction of his great architectural works he made large use of wood which is called Cedar of Lebanon. One, indeed, of them went by the name of the House of the Forest of Lebanon, a building of great size, of which a large portion must undoubtedly have consisted of wood. When we remember that for months he employed an army of many thousands of wood-cutters to cut down trees in Lebanon, besides great numbers of other workmen to despatch the timber by sea to its destination, we shall obtain some notion of the vast quantity of timber employed for the purposes for which Solomon designed it. Was all this cedar-wood? Clearly not; a great deal is distinctly stated to have been "timber of fir," that is very probably, the wood of the Pinus Halepensis, a tree which still grows on the lower slopes of the Lebanon range. But after subtracting from our estimate of the whole amount of timber used such a quantity as may be considered to fall under the description of fir-timber, there evidently remains to be considered an enormous quantity of cedar properly so called. The only question is, what was the tree which bears this name, was it the one which we call Cedar of Lebanon or another? I will endeavour (1), to state the qualifications which are ascribed in Scripture and elsewhere to the tree bearing this name; (2), to mention the claims of other competitors; and (3), to lead to a conclusion on the whole subject. 1. Let me mention that the Hebrew word which is rendered "cedar" and which is virtually identical with the Arabic word by which the Lebanon cedar is still called, is derived from a root which signifies "coiled" or "compressed," and this conveys a notion of concentrated strength, one which recommends itself strongly to our minds in reference to the cedar of Lebanon. 2. The tree itself is described as tall, spreading, abundant, and loving the water, a point of which I will ask you specially to take notice. 3. The timber is described as useful for beams, pillars, boards, for carved work, and for masts of ships.

We can have little doubt as to the estimation in which the cedar was held by the builders of Solomon's temple and palaces, and we find in later days that when the temple was rebuilt by Zerubbabel, it was the same timber which was employed, and later still in the great restoration made by Herod. Again, when Justinian built at great cost a church at Jerusalem in honour of the Blessed Virgin Mary, he had difficulty in finding timber of sufficiently large scantling for the roof until some cedar was procured from a place of high situation. And lastly we are told that when the church of the Holy Sepulchre was rebuilt in the 11th century after its destruction by the Mohammedan Khalif Hakim, the roof of the Rotunda was constructed of cedar beams.

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When we turn to so-called secular writers, we find mention of a bridge over the Euphrates built by Semiramis, in which cedar wood was largely used, and Mr. Layard tells us that the remains of wood among the ruins of Nineveh are of cedar. Pliny says of the cedar that it loves mountainous situations, that its durability is very great, so that statues of deities were made of this material, and that the roofs of certain well-known buildings were for this reason constructed of it, such as the temple of Diana at Ephesus; and a temple of Apollo at Utica, in which cedar timber from Numidia was used, had lasted 1178 years. Vitruvius, speaking of timber, mentions the cedar as yielding an oil which is capable of preserving from decay the defects to which it is applied.

These passages and instances, which are confirmed by many allusions in the works of ancient poets, are quite enough to show the opinion generally entertained in ancient times about the qualities of the cedar. Let us now consider the question whether they are all to be attributed to one tree, and whether that tree was the Cedar of Lebanon. But let me first say a few words about the tree itself, and its various abodes. There is no doubt whatever of the present existence of it in Lebanon. The cedar grove there consists of about 400 trees, of which 11 or 12 are very large and of great age, twenty-five of a secondary size, and fifty of a third-class in this respect. They stand in a depression of the mountain, near the sources of the Khadisha, or Holy River, about 6,400 feet above the sea, and about 3,000 feet below the summit. The number of trees, especially of the older and larger ones, is gradually diminishing, not only from inevitable age, but from the mischievous depredations of relic-hunters, a race of whom I cannot speak without a respectful abhorrence. The largest tree in 1836 measured 35ft. 9in. in circumference; Dr. Thomson in 1857 says "more than 41ft," and a writer of an article in the "Bible Educator" says 47ft. It was then about 100ft. in height. These venerable trees are regarded with great reverence by the inhabitants of the neighbourhood; a chapel has of late years been erected at the spot, and mass is from time to time celebrated there by the clergy from a neighbouring convent. Besides these trees there are many other cedars in other parts of the Lebanon range, and the tree is found in the Amanus range in Cilicia, and also in that of Atlas in Morocco, a fact which confirms to some extent the statement of Pliny about Numidian cedar-wood.

The cedar of Lebanon was introduced into this country about 1683, probably by Evelyn, who mentions it in his Sylva with high recommendation, and among those which were first planted are the trees still existing in the old "Physic Garden" of Chelsea. In 1766 two of these were 12ft. 6in. in girth at two feet from the ground; in 1793 the same trees were only 12ft. 11½in. in girth; in 1834 they were 15ft. in girth, and in 1844 they were fast falling into decay. You will remember the Scriptural expression of "cedars by the waters," and also what I just now said about the immediate neighbourhood of Lebanon trees to the sources of the Holy River. The writer of the passage in the Book of Numbers was quite right in his remark as to the love of the cedar for moisture. Up to 1766 the Chelsea cedars grew thrivingly, but between that date and 1796 they only increased about 6 inches in girth. How was this? Up to the former date there was a pond close

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to them, which soon after was filled up, and hence the decline in growth of the trees.

I have before me a few statistics on the other cedars besides those of Chelsea, which it may be worth while to lay before you.

BLENHEIM, date of planting unknown, but probably under 100 years. The largest trees 22 feet and 21 feet 6 inches in circumference at 5 feet high.

KING'S ACRE, planted in 1785, girth nearly 14 feet.

WHITFIELD, age 78 years, girth 14 ft. 6 in. and 12 ft. 6 in.

MOOCAS, age unknown, girth 14 ft. 7 in.

BREDWARDINE, aged 55 years, girth 12 feet.

And now we may ask, is there any reason to doubt whether the timber used by Solomon for his great works, and mentioned by the writers quoted above, be the produce of the tree which we call Cedar of Lebanon. In reply to this question I may say that doubt has existed chiefly, I think, on two grounds. (1) That the timber obtained from existing trees, both in this country and in Lebanon itself, is by no means of superior kind, but generally not better, certainly, than white deal. (2) That the use of it for masts of vessels, mentioned by Ezekiel is one for which cedar is ill-suited.

Now there is no doubt that the Hebrew word for cedar is sometimes used in a loose and general sense, more in accordance with its etymological origin than the specific character of the tree. We have already seen this in the case of the "cedar wood" used in the Jewish ritual, and it is very probable that the masts mentioned by Ezekiel may have been made of the *pinus Halepensis*, which is found in the Lebanon, and which probably supplied the "fir timber" so largely used by Solomon. Moreover, the LXX. version of the passage renders the word by "masts of fir."

But the main objection lies in the supposed general inferiority of cedar timber. To meet this difficulty several suggestions have been made. 1. That the tree which furnished the "cedar" timber was not the cedar of Lebanon, but its very closely allied and nearly resembling congener, the Deodara. The two trees are sometimes so alike that to one who is not a professed botanist they are scarcely to be distinguished. Of the Deodara the leaves are more distinctly three-sided, and the cones grow in pairs, and are rather larger than those of the cedar. It yields excellent timber in its own country, but has not, I believe, been much tested for that purpose in our own.

2. That yew, "taxus baccata," furnished some at least of the timber for Solomon's work. It is still common in the Lebanon. In favour of this claimant it has been alleged by an able botanist that the wood found at Nineveh, which was at first thought to be cedar, has been proved by microscopic examination to be yew. On the other hand, another careful observer, well qualified to judge, is convinced by similar examination that it is not yew but cedar of Lebanon.

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3. The "Pinus Pinsapo," or Cephalonian Pine, which is abundant in Mount Atlas and the Ionian Islands, has been thought to have been imported by the Phœnicians under the name of cedar.

4. The noble tree, "Thuja articulata," or "Callitris quadrivalvis," which is abundant in Morocco, and which is also found in the Lebanon, has been thought to be a likely competitor, at any rate, with the cedar, for some of the purposes which the latter was formerly believed to have been exclusively supplied. It yields excellent timber, which in ancient times was very highly valued, and sometimes retched enormous prices.

5. The larch has also been thought of, whose qualities and character are so well known to us all.

But though some of these trees may have been used in the course of the great works of Solomon, there is really no convincing reason to deprive the cedar of Lebanon of the honour, so to say, of having furnished the bulk of the timber bearing its name. The deodara is certainly not now found in Lebanon, the Thuja articulata to no great extent, and though Aleppo pine, larch, and yew may very probably have been included among the classes of timber called under the general name of cedar, there is no good reason to doubt that the cedars of Lebanon were really the source of Solomon's supply. In reply to the objection against the quality of the timber, I may say

1. That we do not know anything of this quality at the date at which it was so employed.

2. That I know one instance in which some cedar planks have been worked into a communion table, of which the appearance is very pleasing, and the quality, so far as can be judged, excellent.

3. That Solomon made use of the best timber he could find at the nearest place of supply. Palestine was not a country of forests; Phœnicia, and Lebanon in particular, abounded with them. He therefore resorted to that country, so near to his own, affording so much facility for transport, in order to provide for his undertaking. Though cedar may not have yielded the best possible timber in the world, that which it produced was the best attainable, and of this, therefore, he probably availed himself. I see no solid reason for dethroning the Lebanon cedar from its high dignity in furnishing timber for the works of Solomon, or for those other purposes which have been mentioned—a dignity which for so many years it has held without disturbance, and which the question that has been raised has served, I think, mainly to consolidate.

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REMARKABLE TREES IN THE NEIGHBOURHOOD OF LONDON.

BY MR. W. A. SWINBURNE.

After seeing the magnificent woodland scenery we have to-day at Croft, and the grand old trees there, I am really afraid to bring before you my notes on my favourite trees, for some of those we have seen to-day are powerful competitors to my friends in Kent and Surrey; but as Mrs. Malaprop correctly remarks, that comparisons are "odorous," I will still venture to read what I have written.

It may seem to be travelling a little out of the sphere of the Woolhope Club to carry its members to the shady groves and verdant fields of Kent and Surrey; but we have of late become more cosmopolitan, and since we have travelled with Captain Mayne Reid to the floating gardens of Mexico, and to-day with our worthy President to the slopes of Lebanon, perhaps I may be excused if I presume to take you to the environs of the great Metropolis; and in doing so I may state, what I dare say is well known to most of us, that in loveliness of landscape, in beauty of form and foliage, and in all the rich profusion of Nature's gifts, there is no part of the kingdom more highly favoured than the immediate vicinity of London. If you wish to give the "intelligent foreigner" a good idea of the glories of our land, you need not take him far from his café in Leicester-square or his club in Pall-mall. Of course I do not allude to the romantic, or the grand, or the sublime in Nature; to seek that you must go to North Wales, the English Lakes, or the Highlands of Scotland; but for all that rich pastural and sylvan beauty, which is so peculiarly English, half-an-hour's spin by rail or a couple of hour's carriage drive will take you and him far from the busy haunts of men, and into such quiet solitudes and through country scenery, that you may fancy yourselves 100 miles away from Town instead of 10. With the single exception of the lowlands in Essex, and the marshes on the banks of the river by Plumstead, there is a complete zone of beautiful country all round the Metropolis. A reference to a map of the environs of London will show this. Follow the course of the sun, and begin near the river at Abbey Wood and Erith, then by the Crays, Chislehurst, Bromley, Hayes, Whichham, Addington, Sutton, Cheam, Ewell, Hampton Court, Bushey and Richmond Parks, Harrow, Hendon, Finchley, and so on to the Cockney's Paradise—Epping Forest. Or if you take a wider circuit you include Windsor, Dorking, Boxhill, the North Downs, Chevening Park, the Knockholt Beeches, &c. In all this charming country I propose to take you to two spots, where we can see some grand old trees amid lovely scenery. The first is Hayes Common. It is of some considerable extent, and one of the few open spaces round London that have been protected by Act of Parliament from the encroachments of the builder, and the desecration of bricks and mortar. It is covered chiefly with gorse and heather, and is elevated at its western side somewhat above the level of the adjacent country. On the slope leading from its level to that of the lower land are the remains of a very ancient oak forest, and some very fine specimens of old oaks are to be seen there. Staying with a friend in the neighbourhood, I took the opportunity to revive recollections of bygone pleasant visits to

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the old trees, and that pleasure was intensified by the keen appreciation of nature and nature's beauty acquired by a few years association with the Woolhope Club. There are not many of the old denizens of the forest left, and they are of different ages, or at least in different stages of growth, or rather decay. A few near the public road are flourishing in abundant branches and foliage, though almost all hollow in the bole. Others are most venerable and picturesque ruins. Unable myself to "draw" anything except an inference, or a jug of beer, I enlisted the services of my wife to make me some sketches of these trees, but on our arrival at the wood the drawing materials were like the Dutchman's anchor—at home; and so a very imperfect and rough sketch had to be made on improvised and insufficient material. This must be my apology for the style of those I now show. The sketch marked A on some note paper is that of one of the most aged-looking of the oaks. Its girth at 5 feet from the ground is 23ft. 4in. Others measured 17ft. 2in., 20ft. 3in., 20ft. 7in., 21ft., 21ft. 3in., and 24ft. 1in.; but the monarch of all is the Alfred oak as it is called, of which sketch B on wrapping paper is an attempt to show the trunk and lower branches. It is a grand old fellow, but very difficult to measure by our club rule of 5 feet from the ground, for at a little over 3 feet it sends out an immense arm, which at its juncture with the main stem is itself 18 feet in girth. Beneath the arm at 3 feet from the ground the tree measured 23ft. 8in.; round the elbow of the arm at 5 feet its girth is 28ft. 4in., and above the arm 21ft. Local tradition makes this oak the one under which William the Conqueror halted, and it is called the Alfred oak; but whether that good king planted it or not I did not learn. I could not climb up high enough to see if it is hollow; but it seems full of vigour, and one of its most recent shoots is itself a very respectable tree. Of course we only attempted to delineate the trunk and lower branches.

Hearing of our mishap about the drawing materials, an artist friend has lent me some water-colour sketches made some years ago of these very trees, which give a better idea of what they are like. The spread of these old oaks is not very great, as they are all pollards, and are crowded round by a younger growth of oak and beech, but as far I could make out the Alfred spread its branches over 25 yards in diameter. In this wood are some fine specimens of young beeches, and some very large birches.

The country about Hayes is very beautiful, and the timber particularly fine. In the hedge-rows are very fine elms; one I measured near the oak wood at Coney Hall Farm was 19ft. 2in. girth at 5ft. from the ground. It is a pollard, and I may mention that all the oaks I have named are also pollards. Mr. Reed, the rector of Hayes, is of opinion that these old trees have become pollards from natural causes, and not by the hand of man. He thinks that successive storms have denuded them of their heavy laterals, and then in the lapse of ages the new shoots have become what we now see, splendid spreading branches. At any rate a very long time must have elapsed since they were pollarded, for these new branches bear the marks of extreme old age. To hazard a conjecture as to the age of these trees would be the veriest guess, although I see no reason to doubt the local tradition about Alfred's oak.

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I must now carry you to another spot of suburban sylvan beauty. About two miles south of Croydon, close to the Brighton railway, is a tract of common land, called Purley Downs, dotted all over with juniper bushes, but unfortunately spoilt by a new railway being cut through the middle of it, and a rifle range made in one part. Before these innovations it was a very pretty bit of natural scenery. The short greensward was ornamented with the juniper, sometimes in single bushes and sometimes in little groups of five or six, and it was delightful to ride or drive in among the shrubs of nature's planting. At the extreme northern side of this common is a grove of beeches, and amongst them half-a-dozen giants, which it is worth a much longer pilgrimage to visit. They are indeed powerful rivals to my friends at Hayes, for they have been allowed elbow room to grow in, and their grand proportions have been fully developed. I measured four of the largest, and their dimensions are as follow :—

No. 1, 15 ft. 6 in. girth ; spread of branches, 24 yards.
2, 16 ft. ,, ,, ,, 29 ,,
3, 19 ft. ,, ,, ,, 21 ,,
4, 25 ft. ,, ,, ,, 26 ,,

The first three are fine trees in full vigour of growth. No. 4 is a much older tree, and is split and gnarled in a most picturesque manner. I was alone in my visit to Purley, and have therefore no sketch to show, which I much regret, for No. 4 is a splendid old fellow. My artist friend who had visited these beeches some time ago has lent me a sketch in water colours, which shows them better than any descrip- of mine. I think the larger tree in his sketch is the one I call No. 3. To look up into those trees and see the massive trunk and leading branches towering aloft, clothed with that beautiful bark peculiar to the beech, covered over with its bright green canopy of leaves, and lighted up, as I saw it by a brilliant sun, was a sight never to be forgotten by any one who has the slightest right to belong to the Woolhope Club, or call himself a lover of nature. But that I dread the displeasure of our reverend president, I would say that I could worship such a tree as I saw then. I can forgive the Druids all their superstition for their reverence of a great tree, and I will not confess how nearly I broke the first commandment both at Hayes and at Purley.

In conclusion, I would say to the members of this club, that when tired with the din and bustle of London they cannot do better than find their way to Hayes, or Purley, or both, and I am sure they will return refreshed and invigorated with a quiet carouse with Nature there. I should be glad to aid anyone by my knowledge of the localities in giving him detailed directions how best to reach these places, which I need not enter into now. To any mycologist amongst our members I may mention that Mr. Reed, the rector of Hayes, possesses the original drawings of fungi made by his sister, Mrs. T. J. Hussey, the talented authoress of "Illustrations of British Mycology," and I dare venture to say that he would gladly show them to any of our members who called upon him, using my name, on their way to the oaks of Hayes Common.

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Post Prandial Postscript.—Before placing this paper in the hands of our Secretary I may add, by way of P.S., some account of the fine old trees we have seen to-day at Croft Park and Ambery. We were first taken to a grove of splendid old Spanish Chestnuts, containing some trees of grand proportions and extreme old age. One measured 20ft. 9in. in girth at the club level of 5ft. and another, a magnificent old fellow, was 22ft. round and had a large and long horizontal limb about 8ft. from the ground, which was itself 10ft. 3in. in girth. Another tree was noticed of such weird and fantastic form as to draw forth the expression from one of its admirers that no one but Doré could do justice to it in sketching it. On our walk up to the Ambery we saw very many fine trees, amongst them one measuring 24ft. 3in., and another 23ft. 6in. On the old earth works of the Ambery itself a venerable beech measured 15ft. 6in., and a remarkably fine ash 17ft. 10in. On the return walk down the dingle a number of very large larches were pointed out, one of which was 10ft. in girth, and from actual measurement taken some time ago was found to be 140ft. high! An unusually large tulip tree was also shown us, estimated at above 50ft. high, and at the regulation height from the ground was found to be 9ft. 9in. in girth; perhaps the largest tree of its kind known.

These particulars give but a very faint idea of the sylvan beauties we have seen to-day. Indeed, we must all admit that the walk of to-day has been unsurpassed, nay, unequalled, by any field excursion we have ever made. Our thanks are due to the proprietor of this charming domain for permission to inspect it, and most especially to the kind guidance of the Rev. J. Edwards, the rector of Croft, who took every pains to point out all that was worth seeing, and accompanied us in our long and most delightful ramble.

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Woolhope Naturalists' Field Club.

THE usual annual meeting of the Woolhope Club for a foray among the funguses, was held on Thursday, October 3rd. The following gentlemen were present—The President, the Rev. H. W. Phillott, M.A., Mr. Edwin Lees, F.L.S., F.H.S., &c.; Worcester; Dr. Cooke, from London; Mr. C. E. Broome, F.L.S., Bath; Mr. C. B. Plowright, from King's Lynn; Rev. J. E. Vize, Welshpool; Mr. W. Phillips, Shrewsbury; Messrs. Renny, Howse, W. G. Smith, and Mr. Bicknell, from London; Mr. Cecil H. Spencer Perceval, from Clifton; Rev. J. M. Du Port, from Norfolk; Mr. Arthur Armitage, Dr. Bull, Mr. H. P. Bull, Misses Bull (2), and Miss Ellis, Mr. Cam, Mr. Chapman, Mr. George Cocking, and Mr. C. Fortey, from Ludlow; Mr. T. Curley, F.G.S., Rev. J. F. Crouch, Rev. James Davies, (Moor Court), Mr. E. Howarth Greenly, Rev. H. W. Gretton, Rev. E. T. Holloway, Mr. Theodore A. James, Rev. H. Cooper Key, Mr. John Lambe, Rev. J. J. Lomax, Rev. A. Ley, Rev. H. B. D. Marshall, Mr. C. G. Martin, Rev. G. M. Metcalfe, Mr. J. Griffith Morris, Mr. J. E. Norris, Mr. J. Phillott, Mr. C. Rootes, Mr. Theo. J. Salwey, Mr. O. Shellard, Rev. W. R. Shepherd, Mr. Henry Southall, Mr. W. A. Swinburne, Mr. J. R. Symonds, Rev. G. Thackwell, Rev. H. W. Tweed, Mr. Theo. Lane (secretary), and some others whose names we were unable to procure.

The members and visitors drove to the lawns of Sufton Court, and were very kindly received by Mr. Hereford. The mycologists were soon successfully occupied in the woods, whilst the less scientific portion of the company wandered up the hill to the British Camp, at Adam's Rocks, Backbury Hill. The day was very fine, and the views never looked more lovely. A successful day on all sides.

A meeting of the members was held in the club room, at the Free Library, as soon as they got back to Hereford, when the following officers were elected for the ensuing year:—President, Mr. Arthur Armitage; Vice Presidents, Rev. H. W. Phillott, Mr. W. A. Swinburne, Rev. A. Ley, and Rev. G. M. Metcalfe; the Central Committee, Messrs. T. Curley, J. Griffith Morris, C. G. Martin, and O. Shellard; Treasurer, Mr. Cam; Auditors, Messrs. J. Davies, and J. T. Owen Fowler; Secretary, Mr. Theo. Lane.

Messrs. Cecil H. Spencer Perceval, of Clifton; and T. Howse, F.L.S., of London, were elected honorary members of the club, and some other members proposed.

The Pomona Committee laid before the members the first part of the "Herefordshire Pomona," which from the perfection of the plates, its literary

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merit, and the handsome manner in which the whole work has been produced, gave very great satisfaction to all the members present. A vote of thanks was unanimously voted to Dr. Bull and the Committee for the trouble they had taken with it.

The dinner took place at the Green Dragon, when the two funguses, *Hygrophorus pratensis*, and *Agaricus nebularis*, were served to the guests, the latter, which is one that is rarely eaten, proved to be a species well worthy of the occasion.

Dr. Bull, after dinner, gave the cordial welcome of the club to the scientific strangers present, and then gave a report on the progress of mycology during the past year.

The Rev. Augustin Ley then read a very carefully prepared paper on "The Mosses of Herefordshire," which was very highly applauded for the results of real work in the fields which it contained, and which was ordered to be printed in the Transactions of the Club.

A soirée was held in the evening at the house of the treasurer, Mr. Cam, which was well attended by the members and visitors.—Dr. Cooke read an elaborate paper on the genus *Corticium*, with observations on the modes of distinguishing the British species.—Mr. Phillips, of Shrewsbury described a new Peziza (*P. crucifera*), which gave rise to a long and animated discussion, and which created great interest.—The Rev. J. E. Vize exhibited an *Æcidium* from the Cape of Good Hope to the members, one of the finest of its tribe. He showed a number of other interesting objects under the miscroscope.

The evening passed off with as much interest and satisfaction as the foray had done in the morning, and this is to award it a high meed of praise. The pleasure of the evening was greatly enhanced, as it ever is, by the kind reception and hospitality shown to the guests.

ANOTHER ACCOUNT.

[By Mr. T. Howse, F.L.S.]

The annual Fungus Foray of the Woolhope Club took place during the first week in October. It was attended by most of the leading mycologists—Messrs. Cooke, Smith, Renny, Phillips, Plowwright, Broome, Spencer Perceval, Lees, Vize, Howse, Bicknell, and others. The weather was remarkably fine, and with the exception of the afternoon of Friday no rain fell during the whole time. Although many of the common Agarics were absent, owing probably to the exceptionally early season, a larger number than usual of novelties were discovered, many of which have still to be studied and named.

The first excursion on Tuesday, October 1st, was arranged for the woods on the banks of the Wye below Symonds Yat station on the Monmouth line. Few fungi were found; the mycologists were, however, much interested in the caves on the right bank of the Wye, in which bones of bear, hyæna, &c. have been discovered. Among the Fungi found may be mentioned *Tricholoma acerbus*, *Tricholoma ustalis*.

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Pluteus chrysophæus, *Flammula carbonarius*, *Leptonia incanus*, *Cortinarius anomalus*, *Lactarius uvidus* and *fuligineus*, *Marasmius erythropus* and a *Clavaria*, which gave rise to an animated discussion between Messrs. Cooke and Plowwright, and was supposed by the latter to be *argillacea*.

The next day (Wednesday) was devoted to the classic ground of Dinmore. The time was short and the portion examined smaller than usual, but it yielded an unusual number of interesting species. Mr. Spencer Perceval found *Peziza saniosa*, a species with a violet juice, which has only been found once or twice before in this country, also *Strobilomyces strobilaceus*. In addition to this may be recorded *Hebeloma obscurus*, *Pholiota unicolor*, *Eccilia atropunctata*, *Mycena rosellus*, *Cortinarius callochrous*, *tabularis*, *flexipes*, and *sublanatus*; *Lactarius plumbeus* and *pubescens*, *Panus torulosus*, *Thelephora Sowerbii* and *Hypomyces rosellus*. In the evening, a telegram was received from three Parisian friends—Messrs. Cornu, Roze, and Cintract, wishing success to the Woolhope meeting.

On Thursday, Sufton Court, the residence of Richard Hereford, Esq., was visited. This, like Dinmore, yielded many interesting species, among which may be mentioned *Mycena pelianthinus*, *Pholiota erebius (Leveillianus)*, *Pluteus phlebophorus*, *Entoloma sinuatus* and *rhodopolius*, *Russula lepida*, *Hygrophorus puniceus* and *pratensis*, *Polyporus intybaceus*, *Clavaria pistillaris*, *Peziza leporina*, *succosa*, *hemisphærica*, and *Cortinarius armeniacus*. Mr. Plowright dug up a rare tuber, a species of Balsamia.

In the evening, the usual annual dinner took place, and afterwards, Mr. Augustin Ley read an interesting paper on the Mosses of Herefordshire. Dr. Bull made an amusing speech, alluding to the various accounts of poisoning by fungi. He read an extract from a paper, describing how a man had been taken seriously ill after partaking of bread pudding, and thought if such a case had occured it was not surprising that persons should be ill after eating improperly cooked and carelessly selected fungi. He announced that Mr. Spencer Perceval and Mr. Howse had been elected honorary members of the Woolhope Club. Mr. Plowright also alluded to the recent case of poisoning by fungi, in Norfolk, and stated that the species eaten had been selected in the dark, and so covered with pepper that their taste could not be recognised. *Hygrophorus pratensis*, and *Clitocybe nebularis* were served at the dinner of the Club, and both highly approved of, especially *C. nebularis*, which had the flavour of ketchup.

At the Fungus Exhibition, in the large room of the Museum, a considerable number of species were represented. The most remarkable were *Tricholoma frumentaceus*, brought by Mr. Renny, and a curious *Hypholoma*, with a connate stem, differing from *lacrymabundus* by its cæspitose habit and dry gills. The Rev. M. J. Berkeley sent *Hygrophorus lacmus*, *Hygrophorus turundus*, *Hygrophorus Wynnei*, the last a new species. After the dinner a soirée was held in the house of Mr. Cam. Dr. Cooke read a paper on *Corticium*, a marvel of patient research in that difficult genus.

"In tenui labor, sed tenuis non gloria,"

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After this there was an interesting controversy between Dr. Cooke and Mr. Phillips on *Peziza crucifera*, established as a new species by the latter. This *Peziza* is very near to, if not identical with, *P. virginea*, but has cruciform crystals of oxalic acid on the surface of the hymenium. Dr. Cooke thought that the presence of an inorganic body in a plant, unless it served some special purpose, was not a sufficient reason to establish that plant as a new species. Sun and rain would soon destroy these crystals and reduce the *Peziza* to the ordinary state of *P. virginea*. Mr. Plowright supported the views of Mr. Phillips.

Mr. Vize exhibited *Æcidium ornamentale*, a fine exotic species, many times larger than any we are acquainted with in this country.

On Friday, the usual excursion was made to the charming Downton Woods, near Ludlow, always prolific in rare Agarics, and rendered doubly (someone said fortyfold) agreeable by the hospitality of the Messrs. Fortey. A large number of interesting fungi were gathered, and some were new species, yet to be identified. The great feature of the day was the presence of an unusual number of *Strobilomyces strobilaceus*. It usually occurs, if found at all, very sparingly; but on this occasion Mr. A. S. Bicknell discovered nearly fifty individuals growing together, but he prudently did not make known the locality to the rest of the party. Besides this may be mentioned *Tricholoma inamœnus* and *cuneifolius*, *Clitocybe odorus*, *Entoloma clypeatus*, *Pholiota heteroclitus*, *Leptoma chalybæus*, *Cortinarius torvus*, *elatior*, *cinnabarinus*, and *bolaris*, *Hygrophorus lacmus*, and *erubescens*, *Clavaria botrytis*, and *amethystina*, *Russula lepida*, *lutea*, and *cyanoxantha*, *Peziza onotica*, and *Hypomyces rosellus*. Mr. Fortey found the very rare *Sphæria Albertina*. In the afternoon the party returned through Oakley Park, the seat of the Clive family, now represented by Lord Windsor. The old oaks were much admired. They are supposed to be over two thousand years old, as they are mentioned as old trees in Domesday Book. *Pholiota terrigenus* was found in the grounds, and fine specimens of *Fistulina hepatica* on the oaks. The party then returned to Hereford, much pleased with the result of their labours. Several of the party proposed attending the Edinburgh meeting in the following week.

"O dulces comitum valete cœtus!
Longe quos simul a domo profectos,
Diversos variæ viæ reportant."

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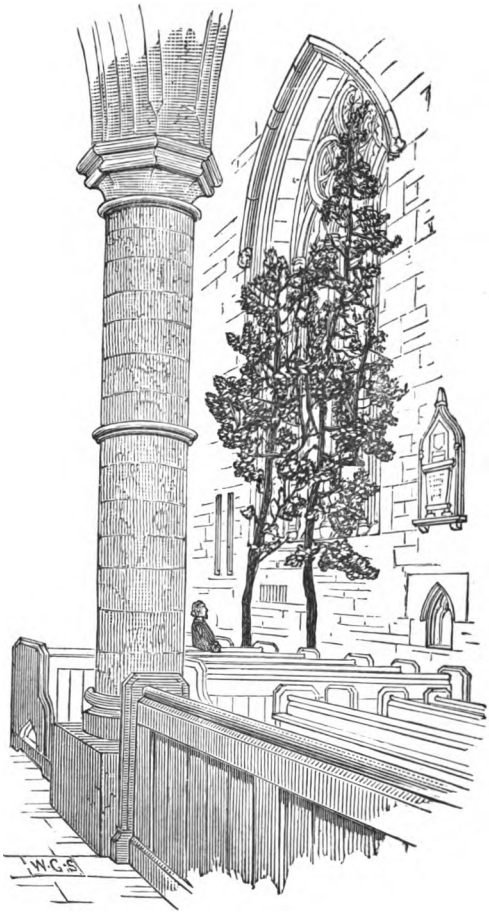

ELM TREES INSIDE ROSS CHURCH.

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THE FUNGUS FORAYS, 1878.

[By Mr. Worthington G. Smith, F.L.S.]

The Woolhope Club held its tenth annual fungus meeting during the unpleasantly fine and sunny week ending October 5—Monday, September 30, being appointed for the arrival at Hereford of the greater Mycophagi from all parts of England. Besides the ordinary members of the Club the following gentlemen took part in the proceedings, viz., Messrs. Bull, Perceval, Vize, Cooke, Phillips, Renney, Bicknell, Plowright, Morris, Broome, Du Port, Lees, Davies, Howse, Walker, and the writer, the members culminating in numbers at the Club dinner to more than half a hundred.

Owing to the irregularities of the trains the arrival at Hereford often entails a long day's journey: for instance, the Rev. Mr. J. M. Du Port (honorary chaplain to the Club) had to start for London from Norfolk at half-past 6 o'clock in the morning, and this was preferable to go across the country, as the trains are always late, and belonging, as they do, to rival companies, the passengers are inconvenienced to the utmost extent. The London men got on very well till they got to Gloucester, but Black Monday being the annual Gloucester "Barton Mop" fair, the station was crowded (especially at night) by thousands of "roughs." First and second class tickets afforded no protection to quiet and decorous passengers, for the drinking, spitting, and tobacco-smoking "Barton Mops" crowded into all classes alike, to the horror and almost suffocation of women and children and decent people. Of course the trains were very late.

Mr. Perceval brought with him two healthy thick and shivering lumps of "dry-rot" in splendid fruit, as a special gift to the gentleman at whose house he was invited to stop; but, alas! for the apathy of some fungologists, Mr. Perceval's host did not seem to appreciate the gift; indeed, he actually asked if the specimens were infectious, and seemed glad when the spore-discharging, quivering lumps were out of his house. Mr. Perceval then most properly made a gift of these two prime specimens to Dr. Bull, who received them with true fungus-feeling, loving, care, and many thanks; after a day or two these objects occupied a post of honour on the new Museum tables.

Tuesday, October 1, was the first excursion day, when it was proposed to ransack the Doward Hills and Wye side. The honorary chaplain with his vasculum, and the historian with his tripod, started by the earlier train for Ross, to see the Wye from the Ross "Prospect" and the elm trees growing inside Ross church. The elm trees (or rather large saplings,) are very curious; they are said to grow near to and to overshadow the pew in which the "Man of Ross" sat. The "Man of Ross" is made famous in the verses of Pope. The saplings are very tall, and

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about eighty years old; they are probably offshoots from the root of an elm (now cut down) which once grew outside the church. Mr. John Kyrle, the "Man of Ross," a great benefactor to the town, and altogether an admirable man, was buried in the Church in 1724, at the age of ninety. On the Church walls, tower, and steeple, there grow *Parietaria officinalis*, *Antirrhinum majus*, *Cheiranthus Cheiri*, *Asplenium Ruta-muraria*, and other plants.

The two honorary officers of the Society before mentioned then met the rest of the party at the Ross station for Symonds Yat, where a boat was in readiness to drop the whole party a mile down the deep and swift-flowing river. The boat was large, but it had more than its full complement of passengers, so that once or twice there seemed a considerable chance of the whole party getting capsized into the river. On the return to Hereford one ancient veteran (who did not accompany the party) had the temerity to say he wished the boat *had* been capsized, because the account of it would then have read so well in the *Gardeners' Chronicle*. Whatever might have been the fate of the chaplain, the honorary historian would not have gone down, for swimming has long been one of his principal "accomplishments." The Doward Hills are uncommonly rich in flowering plants and ferns. Amongst plants seen may be mentioned *Atropa Belladonna*, *Dipsacus pilosus*, *Rubia peregrina* (on which a new Sphærella was discovered), *Cystopteris fragilis*, *Ceterach officinarum*, *Polypodium calcareum*, *Asplenium Trichomanes*, *Scolopendrium vulgare*, and a large number of other plants of note, including many stray plants of buckwheat. Amongst the more uncommon fungi found were the rare, beautiful, and delicious *Lactarius volemum;* the first specimens being found by Mrs. Bicknell. *L. torminosus* and *L. deliciosus* were also found: the first is dangerously poisonous, and the latter sweet and edible; as they grow (and not unfrequently) together, the sharpest fungological eye cannot detect the slightest shade of difference either in size, form, or colour between one and the other. Is this "mimicry?" Does "*deliciosus*" protect itself by taking the form, habit, and colour of "*torminosus*?" No doubt some protection is afforded to "*deliciosus*," for some half-hearted would-be-fungus-eaters are afraid of getting a stray "*torminosus*" into the pot. *Agaricus incanus* was found, with its powerful smell of mice, the large edible *A. strobiliformis*, the beautiful yellow-topped *A. sejunctus*, the cobalt-blue *A. euchrous*, the black *A. fumosus*, the handsome but bitter pine-apple-scented *A. acerbus*, the chesnut-tinted *A. flavo-brunneus*, *A. velutinus* (often mistaken for *A. lacrymabundus*, and both for the true mushroom), the rare and extremely beautiful *Agaricus chrysophæus*, and many other Agarics "too numerous to mention." *Nyctalis asterophora*, a plant rarely seen by Woolhopians, was met with on the Doward Hills in some abundance, as was the very rare *Thelephora Sowerbei*. The "Hercules Club" fungus, *Clavaria pistillaria*, was found, together with the smaller *C. argillacea*, and some immense specimens of the black but edible *Craterellus cornucopioides*.

On the Doward Hills there is (300 feet above the Wye) a hyæna den. The chaplain and historian were first at this den, which has afforded to the Rev. W. S. Symonds a rich harvest of old bones belonging to the cave lion, the cave bear,

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the hyæna, the mammoth, the gigantic Irish deer, the long-haired rhinoceros, the bison, and the fossil horse. Chert and silurian rock implements made by the hand of man, cores or nuclei and flakes and chips of chert were also found by Mr. Symonds near the entrance of the cave. The hill-top is termed "King Arthur's Hall," and on the summit there is an ancient camp: the hyæna den is known as "King Arthur's Cave;" this has been considerably but not completely explored, and there are other caves in the district which have not yet been explored or excavated at all. Dr. Bull entertained a considerable number of the party at dinner in the evening, where one of the invited guests did not put in an appearance till dinner was nearly over. It was the man who wished the boat had been upset, and he did not come to dinner, he said, because he had himself either fallen into "a reverie" or into "the river-y," no one could exactly make out which.

On Wednesday, October 2, the party went in sections, the larger to the fruitful woods of Dinmore, the smaller to the castle and ancient Norman church of Kilpeck and the churches and river gravels of Lugwardine, Hagley, and Wilcroft. The river gravels were visited with a view to the possible discovery of relics similar in nature to the antiquities from the caves, but nothing whatever was found. The churches and churchyards were of interest, Kilpeck being remarkable as one of the best and purest Norman structures in this country.

After dinner there was a meeting at the Museum from 8 to 10 p.m., to set out the Doward Hill and Dinmore specimens, and to arrange, name, and discuss, the species exhibited. There were no apples and pears this year, and in one way this was a good thing, as the delicate aroma given off by certain fungi was not overpowered by the gravid smell given out by *Louise Bonne* and *Marie Louise* pears and *Gloria Mundi* apples. The Rev. W. Elliot, the secretary of the Caradoc Club, sent a good collection of one very handsome (and elsewhere rare) species of *Hygrophorus calyptræformis;* an anonymous donor (supposed to be the chaplain) sent a cork out of a port-wine bottle covered with the well-known cellar-fungus, *Zasmidium cellare.* The London publicans get up an imitation of this fungus, for if one goes to a tavern to get a bottle of fine old 1s. 3d. "Comet" port, the tavern-keeper commonly produces a bottle covered with the "false *Zasmidium*," which is no other than a mixture of dirty old spider-webs, soot, and sawdust—this variety, we may remark, never produces spores. On the Museum table were the rare *Polyporus intybaceus*, the more common oak *(P. dryadeus)*, a doubtful *P. borealis*, and many other plants belonging to the genus *Polyporus.* The sweet-scented *Lactarius glyciosmus*, the soap-scented *Agaricus saponaceus*, *A. fragrans*, with an odour like Melilot; *A. radicosus*, smelling like a linseed-meal poultice; *Hygrophorus cossus*, with the potent perfume of the he-goat; and the black *H. metapodius.* One of the best botanical species was the red-topped *Russula lepida*, *Peziza succosa*, with its yellow juice; *P. sinuosa*, with its purple juice; the green *Geoglossum viride*, *Thelephora anthocephala* and *caryophyllea*, the latter hardly so named because it is "clove-coloured," but, rather, because it is exactly the same in shape as the flower of a large Dianthus. Amongst possibly new plants were *Agaricus innocuus* and *Cortinarius arenatus.*

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Most of the commoner and better known species were represented by Wednesday evening, but one group of fungi puzzled all; it was a large composite mass of Agarics from a cellar, with the exact odour of the true Mushroom, and it was authoritatively labelled *Agaricus campestris*, but the gills were very adnate (not free), and it had not the annulus of *A. campestris:* added to this the true Mushroom does not grow in a fasciculate manner. The probability is that the group belonged to a highly erratic growth of *Agaricus lacrymabundus*, but the plants did not wholly accord with this or any other species described by Fries. The uncommon puff-ball, *Lycoperdon saccatum*, was on the table with *Peziza macropus*, *P. aurantia*, and the extraordinary prolific variety of *P. cochleata*, described and illustrated by Mr. Berkeley, in last year's *Gardener's Chronicle*. *Trichosperma chrysosperma* was exhibited, and *Russula nigricans* and *R. adusta* were shown side by side.

Thursday was the Club day, when the lawns of Sufton Court, and the woody recesses of Backbury Hill, close by, were hunted over with remarkable success, for though the specimens of fungi were few in numbers, yet they were uncommonly good as species. The first piece of good fortune fell to Mr. Broome, for by a trench side he lighted on a choice and prolific piece of wet and greasy rotten rag. On this there was a splendid crop of *Ascobolus carneus* which Mr. Broome lovingly placed in a small sandwich-box for proper security. *Agaricus strangulatus* was one of the first species found, next *A. (Eccilia) atropunctus* (which, by the way, we do not see in Dr. Cooke's new *Clavis*), then the variety *lacmus* of *Hygrophorus subradiatus*, the new *A. innocuus* once more, and *Agaricus sulfureus*, with its strong smell of gas-water or carbolic acid. The vegetable beefsteak *(Fistulina hepatica)* was common on the oaks, distilling and wasting its rich drops of inviting and luscious gravy on the unappreciative grass. The specimens were often tenderly examined by Dr. Bull, but he pronounced them, one and all, to be hardly "ripe enough" for the table; these "beefsteaks" are like some game, best when they are a little "high."

The edible *Agaricus nebularis* was fortunately very abundant, and a few specimens of *Boletus* (Bull-eat-us, as some write it) *edulis* were lighted on. Of truffles, two were raked out by the rakers, probably a *Tuber* and *Hymenogaster*. The curious *Agaricus cucumis*, with its strange smell of stale herrings (cucumbers, according to Fries), and *Thelephora fastidiosa*, with its horrid smell of a putrid carcase. Amongst specimens found worthy of note may be mentioned, *Cyphella galeata;* the rich orange *Peziza onotica;* and the yellow and brown *leporina* and *badia; Helvella elastica* and *lacunosa; Agaricus Candolleanus, unicolor, umbrosus, obscurus, dryinus, geophyllus*, white and blue; the great black balls known as *Hypoxylon concentricum*, and hard black clubs known as *Xylaria polymorpha*, and an Irpex of uncertain name. *Marasmius erythropus* was found in many places. On the top of Backbury Hill, from which there is a view of almost unsurpassed beauty, there is a large ditched camp, and a large section of the exploring party went over this position, under the kind guidance of Richard Hereford, Esq., who explained the botany and geology of the entire district, pointed out a number of

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remarkable trees, and regaled the whole party with bread and cheese and excellent cider.

Before dinner, the fungi were taken to the Museum, and arranged. In the meantime Mr. Berkeley had kindly written a very pleasant letter on behalf of himself and Mrs. Lloyd Wynne, from Coed Coch, enclosing a few fungi of interest; these were three species of *Hygrophorus*, viz., the var. *lacmus* of *H. subradiatus*; the orange-topped *H. turundus*, not yet recorded from Hereford; and a new species of *Hygrophorus*, named by Mr. Berkeley, *H. Wynniæ:* this plant was immediately put under a glass case by Dr. Bull, lest it should be touched by profane and unfungological fingers. Mr. Berkeley will in good time supply the characters, for it would be a mortal sin, never to be forgiven, for one person to dare to describe another person's fungus—for then, according to the laws of botany, the species would always bear the describer's name. We may venture to say that its colour is a beautful pure, semi-transparent, lemon colour, with just a suggestion of green. By dinner time a good number of the other species had been placed upon the table, but these were hardly worth enumeration, as they belonged (with the exception of *Gomphidius maculatus*) to ordinary woodland species.

THE DINNER.

The dinner went off as these dinners usually do; there was a difficulty in getting sufficient edible fungi for the banquet, so the worthy, learned and valuable Doctor, who always presides (may he live for ever!) had to confine his attention to preparations of the truly delicious and succulent *Hygrophorus pratensis*, and the exquisite and highly-pleasing *Agaricus nebularis*. Dr. Bull dispensed these savoury and steaming viands with his own hands to the fifty-two diners, from bowls of rich fungus soup. It really was a treat for all who understood physiognomy (as do all the Woolhopians), to see the unmistakable external marks of internal gastronomic satisfaction suffuse the delighted faces of the recipients as they each consumed the precious and Elysian fungoid comestibles dispensed to them from the safe hands of the Doctor.

Mr. Thomas Howse and Mr. Cecil Perceval were elected Honorary Members of the Society, and then Dr. Bull powerfully reviewed the fungus work of the year, referring to several poisoning cases, and aptly illustrated his remarks by an account of a pauper who lost his life through eating too much pudding. Dr. Bull then read a telegram he had just received from Paris, directed to the officers and members of the Woolhope Club from Mons. Maxime Cornu, their last year's guest. The telegram was sent by M. Cornu and one or two other French fungologists, congratulating the Woolhope Club on the renewal of its work, and expressing pleasant remembrances of the meeting of last year. Mr. Plowright then referred in detail to the two recent poisoning cases at Hampton Court and Norfolk, the general opinon of the members being that the Hampton Court girls were poisoned by *Agaricus fastibilis* (it was growing everywhere at the time), and the Norfolk parties by *Agaricus acutesquamosus*. The Rev. Augustin Ley read, in conclusion, a valuable paper on the mosses of Herefordshire, after which Mr. Lees made a few remarks on mosses and molehills.

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After dinner there was the usual *soirée* at the house of Mr. Thomas Cam, this gentleman, as usual, kindly throwing his house open to every Woolhopian interested in abstruse fungological matters. Here Dr. Cooke read a learned paper on the genus *Corticium*, followed by some remarks on *Peziza crucifera*, by Mr. Phillips: this species has recently been described and figured in the *Gardeners' Chronicle* by Mr. Phillips, and an attempt was made to extinguish the plant as a species by Dr. Cooke. The discussion at the *soirée* gave the outsiders a good insight into scientific sparring. Mr. Phillips skilfully put himself on his defence, and coolly and adroitly defended every vulnerable point of his "*crucifera*." Dr. Cooke (after declaring his undying friendship for Mr. Phillips) then made thrust after thrust, and crucified "*crucifera*." "It mustn't, it couldn't, it shouldn't be a species," said he. He cut the species in every direction, he hit it, he bit it, and then suddenly gave his assailant a foul and severe blow under the belt, for he said the first shower would wash all the "*crucifera*" out of the species by dissolving the "crystals."

At this point Mr. C. B. Plowright came to the rescue of his friend Phillips, who was certainly badly winded, by saying that water does not readily dissolve crystals of oxalate of lime, and that "*crucifera*" was at any rate as good as hundreds of other species which suddenly jump into existence. Mr. Phillips, having recovered his breath, made a few more very skilful lunges, and both assailants agreed that each had had the best of it. Poor "*crucifera*" has no doubt lived peacefully for thousands of years, and now what a fight there is about his little crystals! Whilst this was going on the "honorary chaplain" was very properly describing the virtues of his '47 port and Yquem Sauternes to the writer. The Rev. J. E. Vize then made some remarks. It will be remembered that Mr. Vize is the famous author of Æcidium depauperans; he has now left the study of this horrid depauperised species, and studied an ally of a totally different nature; its name indicates its appearance, viz., *Æcidium ornamentale*. The former was a parasite on Violets, the latter now preys on the Acacia, and although the latter parasite may be very "ornamentale" to the eye of an ardent fungologist, it will never be "ornamentale" to any horticulturist. The author of Peronosporites antiquorum W. Sm., was then asked to say something, but he declined. He wants to live in peace. So for once that half-dozen young slashers and professors who are always ready to worry and tear and declare everything some one else sees or says to be "pure imagination," were disappointed. Antiquorum intends to watch the fights of others in future, and keep his own skin whole if possible: it is only hoped that both sides won't come down upon him over poor "*crucifera*."

THE LAST DAY.

Friday was the last of the fungus-gatherings, and Ludlow and Downton Castle grounds were appointed for the day's exploration. The fungus-eaters left Hereford by rail at 9.15 a.m., and such was the hurry to be off to time that one gentleman went off without his boots, and did not perceive that he was running in his thin slippers till he had nearly reached the railway station, he then ran

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rapidly back to his rooms for his boots, and caught the train (they are never punctual) after all. One of the Messrs. Fortey accompanied the party by train from Hereford, and the other Mr. Fortey met the train on its arrival at Ludlow, with Mr. George Cocking, of Teme Side, Miss Lewis (a new accession to the fungological ranks), and one or two others. Without delay the party drove at once to Downton Castle grounds, and began work in earnest. There was a profuse growth of *Strobilomyces strobilaceus* in every direction, the oldest Woolhopian could remember nothing like it before—young, old, and middle-aged specimens were dotted all over the grassy places and banks in profusion. *Clavaria botrytis*, which is as handsome as rare, was found in good condition, as well as the beautiful *C. amethystina*. *Paxillus pannoides* and *Agaricus heteroclitus*, both rarities, were found. For the first time during the present foray *Agaricus resplendens* was met with, and now in abundance, and the curious and beautiful plant referred to last year without doubt as *A. Russula*. Mr. Howse told us that the plant was not *Agaricus Russula* but *Hygrophorus erubescens*, and that it was "settled" last year in France. It is always pleasant to hear of a fungological matter being "settled," but it is sometimes well to know who has "settled" it. I was once told in Wales that the nature and meaning of cromlechs had been "quite settled," but when I afterwards found that it was a linendraper, who also did a little printing and sold cakes in a neighbouring town, who had "settled" the job, I lost some faith in the settlement; but perhaps there is another case of "protective mimicry" in these two fungi. *Cortinarius cinnamomeus* in its two varieties was found, as well as the magnificent *C. cinnabarinus* and *Russula cyanoxantha*.

During this, the last day, many of the species found on former days were again met with, and an equally large number of small (ignoble, according to Fries) species. Of these I have kept no list. I respect (?) the vast army of microscopic entities and nonentities; their name is legion—they have no end and no beginning, and they are always increasing in numbers, and possibly nine-tenths would be better for crucifying. As usual Messrs. Fortey fortified the whole party in the "Moss House" by the Teme side, which house literally groaned from its foundation to its roof with the load of good things so kindly provided by these two truly good and valuable gentlemen and fungologists. After emptying all the Messrs. Fortey's hampers, boxes, and bottles, the fungologists were like giants refreshed, and returned towards Downton Castle by the other side of the river. *Aspidium angulare*, *Cystopteris fragilis* and *dentata* and *Scolopendrium vulgare* grow by the stony Teme-side, and *Neottia nidus avis* in the woods.

On the return drive the party took Oakley Park, the residence of Lady Mary Windsor Clive, on the way, and paid a visit to the group of so-called "Druid Oaks." These are mentioned as large trees in *Domesday Book*, A.D. 1086. Heard from several persons that Paterson's Victoria Potato is badly diseased this year; this means a good deal, for probably no potato has hitherto so well resisted the disease as Paterson's Victoria. Then, as if never tired of doing enough for the fungologists, the hospitable Messrs. Fortey, of Ludlow, took the whole party to their house, where hot tea and coffee and everthing else one can think of except

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fungi (and this was a curious omission) so loaded the tables that it was simply impossible to see the cloth; and as the dusk of evening approached it gradually became even difficult to see one another. Thus pleasantly, as guest after guest shook hands and heartily thanked the good-hearted Ludlow hosts, the tenth annual fungus-foray of the Woolhope Club was brought to an end.—*From the "Gardener' Chronicle, pp.* 477, 478, 1878.

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Woolhope Naturalists' Field Club.

THE MOSSES OF HEREFORDSHIRE AND OF THE ADJACENT DISTRICTS.

[By the Rev. Augustin Ley, M.A.]

THE subject of this paper is one which has not yet been thoroughly worked out. Indeed, the chief inducement to put together the facts which have hitherto been collected on the subject of Herefordshire Mosses, in the form of a paper for the Woolhope Club, is the hope that some more observers may be thereby stirred up to assist in filling up its deficiencies. With this object, it has been thought best to publish, without further delay, in the *Woolhope Club Transactions*, the list of mosses for Herefordshire, which has been compiled mainly by the Rev. J. F. Crouch, Rector of Pembridge, together with such short notes upon them and some of the more interesting mosses of the surrounding districts as may suggest themselves.

In the following paragraphs I have attempted to group the mosses found in our district with reference to the chief habitats in which they are found.

Of strictly Alpine mosses, we have, of course, no representative; yet there is one which, in all its associations, is so connected with Alpine vegetation that it might almost claim a place among Alpines itself. It is the rock Andreæa (*Andreæa petrophila*, Ehrh.), which is known in two spots which may be reckoned within the Woolhope district. It was discovered by Mr. Crouch, on the rocks of the Hoar Edge, Titterstone Clee Hill, where it exists in abundance; and it occurs also at Nant Gwyllt, in one of the most beautiful spots of the scenery of the Elan, Radnorshire. Doubtless, when looked for, it will also be found elsewhere, on bleak, exposed rocks. Its minute chocolate-coloured leaves and stems clinging to the stones like a lichen, or still more like some of the Alpine Scale-mosses, are easily recognised, when once known. No other member of this interesting genus is likely to occur with us; and I have searched in vain for this one in the Black Mountain district, where it ought to be found.

But though we can thus scarcely lay claim to Alpine or sub-Alpine mosses, when we come down a step, to those which inhabit hill or lower mountain districts,

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the case is different. We get in the Llanthony district a very fair sample of hill moss vegetation. Without being really rich, the Llanthony hills, both in their moorland, in the small cliffs (Tarens, as the local name is) which fringe their sides, and in the glens formed by the smaller streamlets, yield a good harvest to the lover of mosses, as they do to the lover of nature in so many of her other aspects. The moorland of the Llanthony hills is certainly barren as regards the subjects of our paper. It is scarcely boggy enough to support many of the *Sphagna* (Bog-mosses). One or two of the common kinds are indeed plentiful; and a curious form of *Sphagnum subsecundum* occurs in boggy pools on the Ffwddog, which Mr. Boswell informs me he has not seen exactly reproduced elsewhere. One of the Fork-mosses, *Dicranella squarrosa*, a common mountain plant, has been found here alone as yet in our district; *Campylopus flexuosus* is sparingly scattered over the hills; while the curious *Leucobryum glaucum*, which from its withered appearance an uninitiated person would scarcely believe to be a living plant at all, and *Aulacomnium palustre*, are common; both of them, however, are here barren. The tops of the Hatterel range are the only place where, in Herefordshire, I have seen that noble giant of hill mosses—*Polytrichum commune*—so common in more upland districts. Mr. Crouch informs me that it is common in Lyonshall Park, near Pembridge. If you wish to find that pretty little sub-Alpine, *Grimmia Donniana*, you must walk along the highest ridge of the Ffwddog, and examine closely the rocks on its southern exposure; here you will discover it in small quantities; or if you are unlucky, you will have to go to the Radnorshire hills, in the extreme north-west of our district, where (as for example, on stones along the hillsides, between Rhayader and Nant Gwyllt) it is much more abundant and fine. Both the bog Apple-mosses *(Philonotis fontana* and *calcarea)* are also frequent on the Llanthony hills, in the spring-heads, where they accompany *Bryum pseudotriquetrum*, the curly-leaved *Hypna*, and *Ranunculus Lenormandi* among flowering plants. The last *(Philonotis calcarea)*, is fine, and not rare with fruit. This is worthy of note, as it is said to be a limestone plant. It occurs in similar spots on the western slope of Garway hill. Before we leave the moorland and bog mosses, I may be allowed to call attention to that fine bog—one of the few of any extent which we possess—the Trelleck Bog. Here the moss-hunter will find many more true bog-plants than among the Llanthony hills—things even to put him in mind of Scotland, as the scenery surrounding the bog emphatically does. Here at Trelleck he will find the *Aulacomnium palustre* fruiting abundantly; here he will find several of the curly-leaved *Hypna, fluitans*, and fruiting *revolvens*, and the moorland *Dicranella cerviculata;* here he will have a large choice of *Sphagna;* the common *acutifolium* in abundant fruit; *cymbifolium, subsecundum* in several beautiful contorted forms; *plumosum* in the pools, and others, no doubt, if he is one who can come primed with Dr. Braithwaite's recent papers upon the *Sphagna*, at his fingers' ends. Here, above all, he will, if he is so fortunate as to hit upon the exact spot, rub his hands over the rare and curious *Splachnum ampullaceum*. The happy and skilful discoverer of it, at this spot, many years ago, was Mr. Burton Watkins, and the way in which I had it pointed out by him to myself, illustrates both the

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tenacity of the plant in its chosen habitat, and the tenacity of Mr. Watkins' memory. We had been tramping the bog for some time in vain, when, at one of the deepest and most dangerous-looking spots we had met with, Mr. Watkins said to me, "As far as I can remember, within a foot or two, this is the spot where once I found the—" he did not need, however, to finish the sentence; for one of us, stooping down to where his hand was pointing, exclaimed "Why here it is!" And there, no mistake, it was: and there, I believe, it is to be found most years, if you can hit upon the exact spot. This is the only member of this curious family of mosses known at present in the Woolhope district; yet *Tetraplodon mnioides* will no doubt, one day, reward some diligent searcher among the Llanthony or Radnorshire hills. This, however, like its congener, needs many a mile of weary moor-plodding to find. Among the curly-leaved *Hypna* which show a preference for wet places on hill-tops, *fluitans*, *revolvens*, and *commutatum* are common in the Llanthony district; the latter, however, less so than its near ally *falcatum*.

Leaving the hill-tops for the small glens, we get a much more luxuriant growth of mosses. For luxuriance and abundance of a few species, I do not know any place in our district to equal some spots in the small glen descending opposite Llanthony Abbey, and named Cwm Bwchel. Some of the cool shady spots under the cascades here are truly magnificent in their moss clothing; and a few rarer species will be met with, to add a scientific to the æsthetic interest. Here the pretty little *Seligeria recurvata* is not uncommon; *Trichostomum nitidum*, easily told from *Barbula tortuosa* in a dry state by its hard unyielding cushions when pressed with the finger, raises its round bosses upon the rocks. *Grimmia trichophylla* is abundant; the exceedingly curious *Diphyscium foliosum* is not rare. Here the beautiful *Bartramia Halleriana* is scantily found, while its congener *Breutelia arcuata* is more plentiful, but barren. Here, too, is the only spot in our district where *Eurhynchium Teesdalii* has hitherto been found; Mr. Boswell pointed it out to me here this spring. Another beautiful hypnoid, *Hylocomium flagellare* ought to be searched for here, but has not yet been found; though it occurs in similar spots upon the Elan, near Rhayader, and in a glen at Llandogo, Monmouthshire.

But some of the most interesting spots in the Llanthony district for mosses are the rocks skirting the hills on the right hand side of the valley for several miles, forming cliffs, the largest of which takes the name of Taren Esgob. Though exposed and wind-swept, several mosses are here found which are not elsewhere known in our district. For example, the curious *Zieria julacea* and *Bryum filiforme*, *Bartramia Oederi* and *Plagiothecium pulchellum* all grow in close proximity to the *Asplenium viride*, and the remarkable flowering plants *Meconopsis Cambrica* and *Pyrus rupicola*, just on the edge of the counties of Monmouth and Brecon. *Gymnostomum rupestre* covers large spaces on the rocks, as does also *Amphoridium Mougeotii*. *Blindia acuta* is also not rare here, recalling the Alpine parts of Wales and Scotland; here, however, it is smaller and barren. Here, too, and in a smaller cliff of the same sort just above Longtown, in Herefordshire proper, I have found the pretty *Encalypta ciliata* in plenty, and in very fine fruit.

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Leaving, with the Llanthony district, the moorland and sub-montane species, we come next in order to the lower hills of Herefordshire. I know of but few mosses which merit particular mention in this section. Beyond some of the most common *Hypna*, &c., there is not much to attract the muscologist on such open downs of our Red Sandstone, as for instance Garway hill. One species, somewhat remarkable for its absence from such spots in Herefordshire, is *Brachythecium albicans*, which has only been found as yet very sparingly in one or two spots, as Shobdon hill, the western slope of Backbury, and by Mr. Burton Watkins at Trelleck bog, in Monmouthshire. Upon our limestone hills there is somewhat more to repay search. The rare *Pottia cæspitosa* is abundant in spots on the Common hill, above Fownhope. Intermixed with this I was also fortunate enough to find this year a scrap of *Systegium multicapsulare*, and at another time a similar scrap of *Phascum curvicollum*.

When we leave the open parts of the hills for their wooded or rocky sides, we obtain a more abundant moss harvest. The rocky and hilly woods on the borders of the Forest of Dean—for example, Penyard and The Chase, and again the Harechurch bank of the Hope Mansel valley, are rich in mosses, and merit a far more thorough exploration than they have yet received. Here *Tetraphis pellucida* is met with in plenty, and will some time be found fruiting, in which state Mr. Crouch has gathered it near Pembridge. The four allied *Plagiothecia*, *denticulatum*, *sylvaticum*, *elegans*, and *undulatum* are all to be found. *Bartramia pomiformis*, *Mnium cuspidatum*, *rostratum*, and others, are common. Here *Grimmia trichophylla* occurs again: the beautiful *Aulacomnium androgynum* is both fine and tolerably abundant. Here, too, and only here, in our district, as at present known, one of the most interesting of our native mosses is found, the Cave Moss *Schistostega osmundacea*. It has been observed in three or four several localities in the wooded banks on the skirts of the Forest of Dean. This plant appears, besides the partial darkness in which it is always found, to like a peculiar soil; the earth in all the localities where I have seen it being a very fine yellow sand which readily falls away with the touch, while I have looked for it in vain in positions otherwise very favourable but lacking this peculiar soil. We must not leave these mosses of the rocks without mentioning the rare *Grimmia subsquarrosa* and *Cynodontium Bruntoni* which Mr. Crouch has been fortunate enough to find at Stanner; *Pterogonium gracile*, which occurs in abundance at the White Rocks, Garway hill, and at the Buck-stone, West Gloucester; and *Antitrichia curtipendula*, which Mr. Crouch finds in small quantities at Pembridge.

The Wood mosses are in one way more noticeable than any other group; in that they are generally the largest and finest of the family. They are emphatically winter mosses, to be looked for from November to January, just as the wall mosses are to be looked for from February to April. But I do not find so many noticeable species here as in many of the other groups. The larger *Dicrana (scoparium, majus* and *palustre)* are of course common, the latter least so, and not fruiting; and equally of course, the *Mnia hornum* and *undulatum*, with *Atrichum undulatum*, *Isothecium myurum*, *Eurhynchium myosuroides*, and

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striatum, the latter fruiting commonly. *Hylocomium triquetrum* I have also found in fruit once or twice; while cold half-exposed woody banks are the places where, if anywhere, you will find *Hypnum purum* and *Hylocomium squarrosum* in fruit. Of the latter I once found more than seventy capsules in such a situation at Sellack. *Hylocomium splendens* also, and *Thuidium tamariscinum* are found sparingly fruiting in our county; for example, in the Hope Mansel and Carey woods. One of the most beautiful of all the wood denizens—a summer moss this, not a winter moss—is *Polytrichum formosum*, which is far more common in South Herefordshire than the moorland *Polytrichum commune*. *Bryum roseum*, another fine wood species, is decidedly rare with us. I have found it, barren of course, in Carey woods sparingly. Some of the rarer wood mosses found with us are *Campylopus fragilis* (Doward and Hope Mansel woods), *Entosthodon ericetorum* on the Great Doward; *Bryum erythrocarpum*, common on the cinder heaps, &c., of the Doward woods; *Pterygophyllum lucens* found in plenty and in fine fruit in the wooded glen above Llandogo, Monmouthshire; and last, not least, *Didymodon flexifolius*, which occurs on stones in the same spot—a curious position for a moss of the moorlands. *Hylocomium loreum*, one of the finest of our Hypnoid mosses, might be reckoned a sub-Alpine wood moss. It is common enough on the Harechurch bank, Hope Mansel, but not fruiting. In the Elan valley, near Rhayader, I have seen it very much finer and in fruit; and Mr. Crouch has shown me fruiting specimens from Lyonshall. We will not leave the Wood mosses without mentioning one which certainly ought to be found in our woods—*Hylocomium brevirostre*. It may possibly have been missed, from its great similarity to the common *Eurhynchium striatum*, from which it differs in the villose, not naked stems.

Lane and hedge banks abound in species peculiar to themselves. The crumbling, half rocky, half earthy sides of those old hollow lanes which fortunately still abound in many parts of Herefordshire, are spots which never come amiss to the bryologist during the winter and early spring months—or indeed at any time of year, for the banks of a deep Herefordshire lane retain the dampness necessary for moss vegetation even through the summer months, during which the luxuriant growth of grass and herbage in the economy of nature forms a curtain to protect the humbler moss tribes which delight in damp, from the action of the sun. Draw aside this curtain and look carefully into damp corners, and you will still find your winter friends green and flourishing. And there is nothing pleasanter than to hail your old friends of the hedge banks putting themselves out again to notice in the autumn and beginning of winter, as the higher vegetation begins to shrink away, evidently enjoying the return of cool and damp. Here some of the most common of the whole tribe—*Weissia viridula*, the *Dicranellæ*, *varia*, *heteromalla*, and if a wood be near, *rufescens*, the common *Fissidentes*, *taxifolius*, and *bryoides*, *Phascum cuspidatum*, and *Pottia lanceolata*, with *Barbula subulata*, and those ubiquitous Hypnoids *Brachythecium rutabulum* and *velutinum*, *Eurhynchium Swartzii*, and *prælongum*, *Amblystegium serpens*, and many others, form intricate carpets. These are given as examples among hosts of others, more or less common, but too numerous to mention. Nor is it impossible that some

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rarer ones will be detected. If the bryologist has sharp eyes, and peers into the lane hedges with sufficient persistency, and that disregard of the wonder of passers by, without which no one should pretend to be a naturalist, he will find some of the most minute members of the tribe. *Fissidens Lylei* is one of the rarer minute mosses (which it would be difficult to detect if it were not so gregarious), which is decidedly common upon our lane banks. Another, of about the same stature, *Fissidens exilis*, is a good deal rarer with us; I have found it at Sellack. Most minute of all, it is the lane banks where, if anywhere, in Herefordshire at least, he will discover *Ephemerum serratum*. With us this plant is not gregarious—elsewhere, I believe, it is gregarious in fallow fields—but grows scattered, in single capsules, amongst the confervoid growth of other mosses. In such situations it is only a bright sunlight and keen eye which can detect it. Here, too, on bare earth under old hedges, he will find *Trichostomum mutabile* (once in fruit, on stones under Linder Wood, Foy); and here some Screw-mosses which are accounted rarities, but which certainly are not so with us, viz., *Barbula (Didymodon) sinuosa* and *marginata*. The first of these should be looked for on very damp stones, the latter on decaying sandstone in shady places; in which situations in the month of June he will find it very fine and in good fruit. Later on in the summer he will find in similar situations *Gymnostomum tenue* in perfect fruit. Here, too, another rarity exists, which is abundant in Herefordshire, *Mnium stellare;* always barren, but easily known from its congeners by its toothed leaves, destitute of a border. And here he will find the well marked *Scleropodium illecebrum*, taking up whole yards of a rocky hedge bank nearly to the exclusion of all other vegetation. This is certainly abundant in Herefordshire lanes; in fruit it is accounted very rare, but I have found it in this state in King's Capel.

Wall tops are clothed with beautiful moss vegetation in the early months of the year, from January up to April and May; after that they get for the most part burnt up. Here the whole tribe of common Screw-mosses is to be found. The Aloe-leaved Screws *(Barbula ambigua* and *aloides)* are both common, often growing intermixed. Still more common is *Barbula convoluta*, and of course most common of all is *muralis*. The unmistakeable Extinguisher moss *(Encalypta vulgaris)* is not very common with us; but it is found, especially on the limestone. With the *Brya* I am sorry to say I have a very limited acquaintance; but besides the common *cæspiticium* and *capillare*, *pendulum*, *inclinatum*, *intermedium*, *atropurpureum*, and *murale* are certainly found. Tree boles also yield a rich harvest. *Barbula papillosa* is not rare with us; *Zygodon viridissimus* is abundant. I have several times found it fruiting. *Neckera complanata* and *Leucodon sciuroides*, are abundant, barren; the former I have once detected fruiting, on limestone at Aymestry, the latter never. Of tree *Orthotricha* we cannot at present boast a long list—*Lyellii* is common; *leiocarpum*, Mr. Crouch finds at Pembridge; *tenellum* is not, I think, rare; but there—when we have mentioned the common *affine* and *diaphanum*, and some river species to be separately spoken of—the list at present ends. Our timber in Herefordshire is singularly destitute of *Orthotricha*, forming in this a great contrast to the timber of damper counties. Not

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one of the curly-leaved *Ulotas* has been detected with us. This seems especially true with the Oak, the bole of which often rises, in Herefordshire, perfectly clean of every moss, except perhaps a dash of *Hypnum cupressiforme;* in other counties, *e.g.*, Oxfordshire, I am informed it is the main seat of *Orthotricha*. About Ross, that honour is to be given to the Lombardy Poplar, or perhaps the Apple. Why this should be so, I do not know. Equally curious is the preference shown for tree or stone by some closely-allied mosses. For instance, *Barbula ruralis* (or *intermedia*, as I believe most of it is about us) devotes itself to stone walls and tiled or thatched roofs; its near congener, *lævipila*, so like as hardly to be discriminated by the naked eye, is equally partial to trees, and you never find them changing places—if the material is stone, it is certain to be the one, if living tree, it is equally sure to be the other species.

Mud affords one or two peculiar species — *Pleuridium nitidum*, *Physcomitrella patens*, and *Physcomitrium pyriforme*. Bare earth supports the *Pottias*, *minutula*, *truncata*, and *lanceolata*. *Barbula cavifolia*, a plant of mud-capped oolite walls, I once found, on bare clay, on the borders of the Forest of Dean. Bare fields, in winter, yield *Funaria fascicularis*, and *Hypnum chrysophyllum*, in plenty. Rivers and pools have one or two species peculiar to themselves; *Hypnum aduncum* (*Kneiffii* Bry. Brit.), occupies a pool at Allensmore, and was formerly found in the Vallets Wood, Pembridge; *Cinclidotus fontinaloides*, and *Fontinalis antipyretica* are common, the latter once in fruit, in a pool at King's Capel. Worth notice is the *Fontinalis squamosa*, which occurs in the Wye in Herefordshire. This is quite a plant of mountain streamlets, and out of place in our county. But it is abundant in the Wye, three miles above Hereford, clothing all the stones in the shallow stream below Breinton Camp. At Sellack, it exists; but only, as far as I have found, in minute quantities. Is it that it has got washed down in both instances from the upper regions of the river; and, though still flourishing in the district above Hereford, twenty-eight miles further down, is pining and perishing for want of its cool mountain water? A few systematic observations at chosen stations along the Wye, would settle this question.

The river-side, with its rocks and stumps, supports a moss vegetation in many respects quite peculiar to itself. This is more especially the case in the lower parts of the courses of the Wye and Monnow, where you could, with some accuracy, tell the point to which the average of the winter floods attains, by the species of mosses growing on the stumps of the willows and alders. I have noticed on the Monnow, the mud-loving *Barbula Brebissoni* rising to a certain point, with its clean-feeding brother *lævipila* coming down to meet it from above, and the two joining at the point to which the winter floods usually attain; while below both, on the same stump, *Orthotrichum rivulare* and *Cinclidotus* would mark the region which is covered by the water itself for six months in the year. Nor is this sharp line of demarcation to be wondered at, considering that a single one of our winter floods upon the Wye, in the Ross district, will leave a coating, in still places, of three inches in depth, and often more, of the softest and most greasy

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brown slime. Within the influence of this band of slime *Barbula latifolia* is very abundant on the stumps by the Wye, fruiting sometimes in the Ross district. Its rare congener, *Barbula Brebissoni*, is equally abundant all along the Monnow in similar situations, from Kentchurch nearly to Monmouth, and fruiting finely; while on both streams, the two river *Orthotricha*, *rivulare* and *Sprucei*, are common, the former just below the water-line, the latter in the muddy zone. Of course, the common *Leskea polycarpa*, and *Rhynchostegium rusciforme*, are abundant along the river stumps and stones; while the rarer *Scleropodium cæspitosum* is found, and I believe not rarely, on stumps, &c., within the influence of the fertilizing river mud. I have once succeeded in finding this in fruit.

Within the mud, too, a large variety of *Barbula subulata* is common, looking so strange in this situation that you take it at first for a separate species. In connection with this zone of river mud, I will also mention an interesting Herefordshire plant, because it is here especially found fruiting, *Barbula cylindrica*. This has hitherto been considered uncommon, and the fruit a great rarity; but, in our district it is not only common, but ubiquitous, wearying the eye of the collector by presenting itself to him everywhere. Stones, stumps, dry walls, marly banks, the shade, the full sun, the muddy river banks—there is no situation to which, in Herefordshire, it cannot accommodate itself. On the muddy banks of the river it fruits more freely perhaps than elsewhere, but even in this state it is not particular. Why this should be so, while in other counties it is rare, I do not know. In the neighbourhood of Oxford, its place, Mr. Boswell informs me, is taken by *Barbula vinealis*, a plant to say the least quite rare with us, as far as my knowledge goes.

It is on the muddy stones and stumps of the river bank that the greatest Herefordshire moss rarity is to be found, *Bryum Barnesi*, a plant recently discovered by Mr. Barnes in Cumberland, and certainly not infrequent along the Wye, but barren, and usually in very small quantities. Near Breinton I have, however, found large masses together; and it should spur the muscologist to his labours to reflect that in some such situation the fruit will probably be found—a thing which has never yet met the scientific eye of man. I believe this river bank moss vegetation has, as yet, been but imperfectly explored, and only waits to yield its scientific treasures to him who has the perseverance and the skill to tap them.

The Teme and the Lugg I scarcely know at all, yet there is no reason to suppose them less rich than the Wye and Monnow. In the upper river courses, for instance, the heads of the Monnow and its tributaries, there is perhaps not such a peculiar moss-vegetation; but here you obtain *Dichodontium pellucidum*, and *Mnium serratum* fruiting; while about the steep clay banks of the slower and more lowland streamlets, *Dicranum Schreberi*, and *Webera carnea* and *albicans* are not rare. *Fissidens crassipes* is peculiarly addicted to mill wheels and sluices, though it, or something very near it, grows also in the Wye itself. One iron mill wheel near Hoarwithy, is covered with what I believe to be this plant.

One or two rare Hypnoids are found on stones in shady brooklets; *Amblystegium irriguum* grows in such a situation at Breinton; the rarer *A. radicale* I have found both here and in more than one locality in the Ross district; *A. fluviatile*, Mr.

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Crouch has shown me from Leen Weir, near Pembridge; while the curious form of *Hypnum filicinum*, named *vallis clausæ* is reported by Mr. Crouch from Lyonshall. *Eurhynchium speciosum* will no doubt be found in some such situation; I have several times thought I had discovered it, but in vain.

One more district remains, which no student of Herefordshire botany can afford to pass over in silence, I mean the limestone of the Greater and Lesser Dowards. Ill as we could spare these hills from the county Flora in respect to the flowering plants (Mr. Burton Watkins has recorded 580-600 species of flowering plants from these two hills alone), I doubt whether we could do without them much more easily among the mosses. The mosses of limestone districts are here found both fine and in abundance. *Ditrichum flexicaule* and *Camptothecium lutescens* cover the open parts of the hill, the latter often with fruit; while on the broken earthy banks of the Little Doward, the limestone *Funaria calcarea* grows abundantly, along with, and in perfection at the same time as, *Hutchinsia petræa*,—nearly the only station for it in our county. A remarkable variety of the common *Bryum cæspiticium*, var. *imbricatum*, Wils., grows here, and merits further investigation. *Encalypta streptocarpa* is singularly abundant, but no one has had the luck yet to meet with its fruit. On this plant I wish to remark, in passing, that while it is so abundant and fine on limestone as quite to reckon among the limestone species, on the sandstone it seems mostly confined to bridges. Wherever flowing water passes beneath, there you are nearly sure to find it clinging in the mortar between the stones. No doubt this is due to the increased coolness caused by evaporation; but why, if the plant needs this lower temperature on sandstone, does it show itself indifferent to it on limestone banks?

The exposed bluffs of the Greater Doward yield several rarities; *Grimmia orbicularis*, *Trichostomum nitidum*, and *Hypnum rugosum* are all found very near the spot where Mr. Burton Watkins, some years since, detected the Crystal-wort *Riccia sorocarpa*, before only known in North Italy. In open parts of Lord's wood, *Webera nutans* and *Bryum erythrocarpum* are common; while a single spot, about four yards square, is clothed with a plant nowhere else found in our district, *Leptobryum pyriforme*. In the large quarries, *Trichostomum crispulum* is abundant, and fruited finely this summer; and this is the only spot where *Barbula recurvifolia* has as yet been found. On the stones, *Hypnum Sommerfelti*, and *Rhynchostegium depressum* are not rare; and, on a shady rock, I was fortunate enough to discover the rare *Eurhynchium circinatum* this spring (1879). The remarkable variety of *Hypnum stellatum*, *protensum*, occupies a level piece of ground overflowed by encrusting springs; while some precipitous rocks irrigated by these same springs produce *Barbula rigidula* in abundance.

It is remarkable, lastly, how many mosses, the fruit of which is rare, are found in that state at the Dowards. One such has been already mentioned, and many more might be added. *Barbula tortuosa* is not at all rare here with fruit, chiefly in shady situations underneath coppice wood;

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Hypnum molluscum abundant; *H. Sommerfelti*, I have also found fruiting; while in deep shade, under cliffs, on the east flank of the hill, *Mnium undulatum*, *Thamnium alopecurum*, and *Anomodon viticulosus* fruit abundantly. Nor must it be thought that this list represents all that can be found of interest upon these two hills. It must be remembered that the Moss-flora of the Dowards has been examined very far more imperfectly, and during a far shorter period of time, than their more conspicuous flowering vegetation, yet even this often receives additions still. The muscologist may, therefore, hope that many treasures await his discovery here. Why should not, for instance, the rare *Barbula inclinata*, which has been found in very similar situations in Oxfordshire, be lurking on the open parts of the Doward hills; or, again, that other rarity, *Barbula brevirostris*, upon some of its shady moss-grown walls?

In the following lists it will be seen, at a glance, how much has been done, and how much yet remains to be done, in the Moss-flora of Herefordshire. It will be noticed, for example, that nothing at all has been done in Districts 4, 5, 6, and 9; in other words, in all the eastern parts of the county, from Ledbury on the south to Ludlow on the north. I have myself only been able to work at all thoroughly in the Ross and St. Weonards Districts, with occasional visits to the Woolhope and Hereford Districts, and somewhat more frequently to the Black Mountain. It will be impossible to do any justice to our county flora, either in this or any other of its departments, until a few more pairs of eyes will devote themselves to the work of observing and recording, than do now. With regard to the special subjects of our paper, I can assure anyone who likes to take them up, that he will find in them an abundant harvest of interest and amusement, combined with the gentle excitement of feeling that he is more likely in this department of botany, than among the better worn paths of flowering plants, to add some real discovery to the stock of human knowledge. Nor need we fear their difficulty; a quick eye for discerning minute objects and their differences, joined to a love of out-door rambles, and of peering into out-of-the-way corners, are the chief requisites. The main divisions of the Moss family are so eminently natural that the student soon gets to recognise them very easily; and when the facies of the main genera and groups of genera are known, the separate species and groups of species, by degrees, fall naturally into their places; until the eye, as every naturalist knows, becomes educated to recognise minute differences which pass at first entirely undetected. Nor need it be thought that the possession of a high-powered microscope is indispensable. The higher powers are, for the most part, certainly among British species, quite useless. A tolerable pocket lens for field work, with a simple dissecting microscope and its accompanying needles and knives, and a compound microscope with a good inch and half-inch glass are the most that are required. Of course, it must not be thought that rarities will be brought home at once. Unless quite by hap-hazard, rarities will not be discovered until the common species are tolerably well known: and the bryologist especially must be prepared for many disappointments and mortifications when what he has deemed new turns out, over and over again, an old friend in some new dress,

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induced by some difference of state or locality. One of the charms of this branch of botany consists in the fact that it can be pursued best at that time of year, the dead of winter and the early months of spring, when work in most other groups of plants is at a standstill—though, indeed, there is no time of year when mosses may not be collected. Even during "branding summer suns" they are to be found vigorous in some damp shady corner or glen. Nothing, except a deep fall of snow, need keep the bryologist indoors. Another great advantage is derived from the fact that moss packets may be laid aside for an indefinite length of time, and on the application of a little water the plants recover their original form, as if literally come to life again, even after years of compression and desiccation.

The nomenclature and classification adopted is that of the *Catalogue of British Mosses*, compiled by Messrs. C. T. Hobkirk and H. Boswell for the Botanical Locality Record Club, by whose kind leave it is here reprinted. It is arranged with very trifling modifications on the system of Jaeger, which seems to be the nearest to a perfectly natural one as yet laid down. Mr. Boswell, whom I have to thank for ever ready help in the verification of species too numerous to particularise, has contributed the following paragraphs upon the general classification of mosses. The older systems of moss-classification were based altogether upon the variations of the *peristome*, a series of tooth-like organs which in mosses surrounds the mouth of the capsule upon the removal of the calyptra and lid. According as those were present or absent, in one row or in two, 4, 16, 32, or 64 in number (the numbers being always four or one of its multiples), and so forth, the divisions of the genera were made. In a few mosses these teeth are absent, and then frequently the mouth is found protected by a diaphragm or platter-like covering. Many other modifications in detail, as to longer or shorter, entire, divided, or perforated, straight or twisted, paired or single, are met with, and furnish characters for the arrangement of species and genera. It was soon found that this system was open to the same objection as the *Linnæan* system of arranging flowering plants by the stamens and pistils—namely, that it was too artificial. For instance, there are certain species destitute of *peristome*, but obviously bearing close affinities with various other tribes whose members are furnished with this organ. For these, under the old system, an anomalous genus named *Gymnostomum* was established, made up in a great measure of species belonging in a natural system to various genera scattered in different parts of the list. This genus has now been reduced to very small proportions by the removal of most of its members to their proper positions as indicated by general structure. The same remarks apply with equal truth to the old genus of *Phascum* which included mosses with an indehiscent lid. Moreover another practical objection was found to the old arrangement. It is obvious that it required a moss to be in an absolutely perfect condition before it could be, on this system, assigned to its proper place. As, however, there are many mosses which very rarely, some which never, seem to fruit, it was thus deprived of very much of that practical convenience as a key, which still gives to the *Linnæan* arrangement of flowering plants an honoured and acknowledged place

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in modern botany. In the system here followed, all the different portions of a moss and their structure are taken into account in the formation of orders and genera; the position of the fruit and flowers whether lateral or terminal; the structure of the fruit, and that of the leaf cells and vegetable tissue. This last has come to play an important part in recent systems, though more or less overlooked by older authors: and its utility to the student, in the frequent case of mosses extremely rare in fruit, does not need to be enlarged upon.

I may be allowed to conclude with a quotation which, though it is well known, yet deserves, from the singular beauty of its language, a place in every bryologist's memory:—

"We have found beauty in the tree yielding fruit, and in the herb yielding seed; how of the herb yielding no seed, the fruitless, flowerless lichen of the rock? Lichen and mosses (though these last in their luxuriance are deep and rich as herbage, yet both for the most part humblest of the green things that live), how of these? Meek creatures! the first mercy of the earth, veiling with hushed softness its dintless rocks; creatures full of pity, covering with strange and tender honour the scarred disgrace of ruin—laying quiet finger on the trembling stones to teach them rest. No words that I know of will say what these mosses are: none are delicate enough, none perfect enough, none rich enough. How is one to tell of the rounded bosses of furred and beaming green, the starred divisions of rubied bloom, fine-filmed, as if the rock-spirits could spin porphyry as we do glass—the traceries of intricate silver, and fringes of amber, lustrous, arborescent, burnished through every fibre into fitful brightness and glossy traverses of silken change, yet all subdued and pensive, and framed for simplest, sweetest offices of grace? They will not be gathered, like the flowers, for chaplet or love-token; but of these the wild bird will make its nest, and the wearied child its pillow."

"And as the earth's first mercy, so they are its last gift to us. When all other service is vain from plant and tree, the soft mosses and grey lichen take up their watch by the headstone. The woods, the blossoms, the gift-bearing grasses, have done their parts for a time, but these do service for ever. Trees for the builder's yard, flowers for the bride's chamber, corn for the granary, moss for the grave."

"Yet as in one sense the humblest, in another they are the most honoured of the earth-children. Unfading as motionless, the worm frets them not, and the autumn wastes not. Strong in lowliness, they neither blanch in heat nor pine in frost. To them, slow-fingered, constant-hearted, is entrusted the weaving of the dark eternal tapestries of the hills; to them, slow-pencilled, iris-dyed, the tender framing of their endless imagery. Sharing the stillness of the unimpassioned rock, they share also its endurance; and while the winds of departing spring scatter the white hawthorn blossom like drifted snow, and summer dries on the parched meadow the drooping of its cowslip-gold,—far above among the mountains the silver lichen-spots rest, star-like on the stone; and the gathering orange stain upon the edge of yonder western peak reflects the sunsets of a thousand years."

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LIST OF HEREFORDSHIRE MOSSES.

1. **Sphagnum acutifolium.** 14. Sparingly scattered on the Llanthony hills. Ffwddog, Llanthony, 1873, *Ley*. Not found by *Crouch* in the Pembridge neighbourhood. Abundant in the bordering counties of West Gloucester (Mitcheldean Meend) and Monmouth (Trelleck Bog).

Var. **B. deflexum.** Herefordshire face of the Ffwddog, March, 1880, *Ley*.

7. **Sphagnum intermedium.** 14. On the Monmouthshire face of the Ffwddog, March, 1880, *Ley*. Summit of Y-Garth, Hatterels, June, 1880.

8. **Sphagnum cuspidatum.** 11. Park-stile, Lyonshall, *Crouch*. Occurs, I believe, at Trelleck and on Mitcheldean Meend.

Var. **B. plumosum.** 11, 14. Park-stile, Lyonshall, *Crouch*. At Trelleck, very fine. Boggy pools, "Loxy Lump," on the Hatterels, Herefordshire, June 17, 1880, *Ley*.

11. **Sphagnum subsecundum.** 1, 11, 14. Vallets' Wood, Pembridge, *Crouch*. "*Subsecundum* and varieties occur in District 11; but scarcely true *contortum*"—*Crouch*. Ffwddog, Llanthony, *Ley;* a curious variety, of which Mr. Boswell writes to me: "It looks like a gigantic aquatic *Hypnum* at first sight, and approaches to *Sphagnum cyclophyllum* in habit. Probably it is *subsecundum* var. *simplicissimum* N. and H., Bryolog. Germ." Another marked variety occurs on Mitcheldean Meend; and the variety *contortum* is fine both there and at Trelleck. Damp spots, Welsh Newton Common, September, 1879, *Ley*.

Var. B. 14. On the Herefordshire face of the Ffwddog; also on the upper part of the Hatterel range, 1880, *Ley*.

Var. **C. turgidum.** 11. Kingswood, Kington, August, 1880, *Crouch* and *Boswell*.

17. **Sphagnum cymbifolium.** 11, 14. Vallets' Wood, Pembridge, *Crouch*. Mitcheldean Meend, *Ley*.

Var. **B. squarrulosum.** *Crouch*. 11.

Var. **C. compactum.** 11. Vallets' Wood, Pembridge, *Crouch*. Mitcheldean Meend, *Ley*.

27. **Systegium crispum.** 2, 7. Lord's Wood, Great Doward, a single specimen, 1877, *Ley*. Bank at the Rifle Butts, near Hereford, in small quantities; March 1, 1880, *Ley*.

29. **Systegium multicapsulare.** 3. Mixed with *Pottia cæspitosa*, Common hill, Fownhope, 1877, *Ley*.

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31. **Gymnostomum tenue.** 2. Sandstone quarries and lane banks; also on limestone. Fawley; Sellack in abundance; Great Doward, *Ley*.

32. **Gymnostomum rupestre.** 14. Very abundant in the Llanthony District, forming large masses on the rocks of the mountain sides, in all the three counties of Hereford, Monmouth, and Brecon, *Ley*.

35. **Gymnostomum microstomum.** 2, 3, 10. Rare with us, and scattered in the limestone districts. Great Doward, near the bog, *Watkins*. Rocky road bank, near Aymestry, *Ley*, 1876.

36. **Gymnostomum squarrosum.** 14. Gathered in March, 1874, in minute quantities, in a field at Cwm-y-oy (District 14), and marked by Mr. Boswell as correct.

39. **Weissia viridula.** 1, 2, 3, 7, 8, 10, 12, 13, 14. Abundant on hedge and lane banks. Pembridge, *Crouch*. Sellack, *Ley*.

40. **Weissia mucronata.** 1, 2. Wooded bank, Welsh Newton, November, 1878 (one small piece), *Ley*. Specimens gathered at Great Doward, 1874, were also, I think, this species.

42. **Weissia cirrhata.** 1, 2, 3, 4, 8, 10, 12, 14. Generally distributed, but not abundant. Pembridge, *Crouch*. Thatched roof, King's Capel, *Ley*. Great Doward, *Ley*.

43. **Rhabdoweissia fugax.** 14. Tarens, Llanthony Valley, just on the Breconshire border, in plenty, April 8 and 9, 1880, *Ley*.

45. **Cynodontium Bruntoni.** 2. Stone, Great Doward, near the dropping well, October, 1878, *Ley*. Conglomorate rocks, Coppet Hill, plentiful and fruiting, May, 1880, *Ley*.

49. **Dichodontium pellucidum.** 1, 2, 11, 14. Wet stones, &c., chiefly along the margins of rivers and streams. Lyonshall Park, *Crouch*. Banks of the Honddu, Llanthony (fruiting): and on the Wye, Sellack, *Ley*. Harechurch, Hope Mansel, in fine fruit, 1876, *Ley*.

Var. **C. serratum.** 1. With the type; stream side above the Darran, near Skenfrith; February, 1880, *Ley*.

52. **Dicranella Schreberi.** 1, 2, 13. Chiefly along the c ay banks of small brooks. Small stream near Garway; and on the Dore, Pontrilas, 1877, *Ley*. Garden ground, Sellack, 1872; in an old quarry, Sellack, 1876, *Ley*. Open field, Preston-on-Wye, District 13, in fruit, April, 1869, *Ley*.

53. **Dicranella squarrosa.** 14. Wet moorland, on the Ffwddog, Llanthony, 1873, barren, *Ley*. Apparently quite rare on the Llanthony hills.

54. **Dicranella cerviculata.** 11. Vallets' Wood, Pembridge, *Crouch*. I have not seen it from Herefordshire; but it is plentiful at Trelleck bog, Monmouthshire, where it was first found by *Watkins*. Not seen from the Llanthony hills, where it should occur.

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55. **Dicranella varia.** 1, 2, 7, 8, 11. Garden ground, lane banks, &c.; abundant. Titley, *Crouch.* Sellack, *Ley.*

55 B. **Dicranella fallax.** 3, 7. Open field, with *Webera carnea*, Credenhill, March, 1880, *Ley* (fide *Boswell*). Clayey field between Backbury and the Cockshot, in plenty, December, 1880, *Ley.*

56. **Dicranella rufescens.** 1, 2, 12. Banks, chiefly in woods. Brookside, Pembridge, *Crouch.* Near Ross, *Ley.*

57. **Dicranella subulata.** 2, 11. Rare. Grove Wood, Pembridge, *Crouch.* Abundant on a bank at Holme Lacy Station, 1877, *Ley.*

59. **Dicranella heteromalla.** 1, 2, 3, 4, 8, 12, 13, 14. Abundant and growing to a large size in Herefordshire woods. Grove Wood, Pembridge, *Crouch.* Sellack, *Ley.*

71. **Dicranum scoparium.** 1, 2, 3, 4, 8, 10, 11, 12, 13, 14. Woods, &c., especially in hilly, heathy districts. Grove Wood, Pembridge, *Crouch.* Harechurch and Penyard woods, *Ley.*

72. **Dicranum majus.** 1, 2, 3, 8, 10, 11, 13, 14. With the last, but much less frequent. Common Wood, Aymestry, *Crouch.* Queen's Wood, Dinmore, *Ley.* I have not seen it fruiting in Herefordshire.

73. **Dicranum palustre.** 1, 8, 10, 11, 14. Woods, rare. Grove Wood, Pembridge, *Crouch.* Queen's Wood, Dinmore, *Ley.* Garway Common, *Ley.* Welsh Newton Common, fine but barren, September 19, 1879, *Ley.* Fruiting on the Ffwddog, Monmouthshire, April, 1880, *Ley.*

84. **Campylopus flexuosus.** 11, 14. Heaths and moorlands. Lyonshall Park, *Crouch.* Hatteral range, above Llanthony, 1874, a small starved form, *Ley.* Unlikely to be met with in the lowland parts of Herefordshire. On the Monmouthshire face of the Ffwddog, in abundance, March, 1880, *Ley.*

88. **Campylopus fragilis.** 2. Woods, rare. Harechurch Woods, Hope Mansel; Lord's Wood, Great Doward, *Ley.* Rocks, Warm Hill, North face; and Harechurch, in plenty, February, 1880, *Ley.*

90. **Campylopus pyriformis.** District 11. Vallets' Wood, Pembridge, *Crouch.*

93. **Pleuridium nitidum.** 11, 14. Mud of pools and pits. Milton Court, Pembridge, *Crouch.* Brick-pit, Pontrilas, 1874, *Ley.* Not common.

94. **Pleuridium subulatum.** 1, 2, 3, 8, 11, 12, 14. Banks and woods; abundant. Pembridge, *Crouch.* Mordiford, *Ley.* Dinmore, *Ley.* Ffwddog, *Ley.*

96. **Leucobryum glaucum.** 2. Moorland; also on banks and rocks in hilly woods. Harechurch Wood, Hope Mansel, *Ley.* Barren.

101. **Seligeria recurvata.** 1, 14. Rocks and stones in hill districts; not common. West face of Garway hill, *Ley.* Cwm Bwchel, Llanthony, and other spots in Llanthony District, *Ley.*

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106. **Blindia acuta.** 14. Mountain rocks in the Llanthony District, in all the three counties; not rare, but barren; Red Daren, above Longtown, Herefordshire, *Ley.* Fruiting on the Tarens, Llanthony Valley, August, 1880, *Ley.*

108. **Microbryum flœrkianum.** 3. In a hop-yard at Scutterdine, near Mordiford, December 30, 1880, *Ley.*

109. **Sphærangium muticum.** 2, 11. Near Titley station, *Crouch.* Great Doward Hill, *Watkins.*

111. **Phascum cuspidatum.** 1, 2, 3, 7, 8, 11, 12, 14. Hedge banks, bare earth, &c.; abundant. Pembridge, *Crouch.* Sellack, *Ley.*

113. **Phascum curvicollum.** 3. Rare. Lane bank, Backbury hill, 1876, *Ley.* Wall top, Common hill, Fownhope, 1875, *Ley.* Both in District 3, on the Woolhope limestone.

114. **Phascum rectum.** 3, 7. Near Fownhope District, 3. Mistaken by me for *Pottia Wilsoni*, till Mr. Boswell pointed out the error. Bank, Breinton, in very small quantity, mixed with *Anacalypta*, March 1, 1880, *Ley.*

115. **Pottia minutula.** 1, 2, 3, 7, 8, 13. Bare earth, as the rest of the genus. More common on the limestone than on sandstone. Old walls, Kenchester, *Rev. T. F. Smith.* In the large quarry, Great Doward, *Ley.* Summit of the Little Doward, plentifully, 1877, *Ley.* Railway bank, Fawley, on sandstone, *Ley.*

116. **Pottia truncata.** 1, 2, 3, 7, 8, 12, 13. Bare earth, walls, hedge banks, and on the muddy river bank; common. Pembridge, *Crouch.* Sellack, *Ley.*

121. **Pottia Starkeana.** 1, 3. Habits, &c., identical with *P. minutula.* The White Rocks, Garway hill, 1875, *Ley* (marl). Buckenhill, 1877, *Ley* (limestone).

122. **Pottia cæspitosa.** 3. Rare. On the Common hill above Fownhope, in plenty, 1875, and again, 1877, *Ley.*

123. **Pottia lanceolata.** 1, 2, 3, 7, 13, 14. Abundant, at least in the south of Herefordshire, and noticeable from its larger size, and its habit of growing in large tufts. Sellack; Garway hill; Caplar, &c., *Ley.* A variety with the nerve of the leaf forming a lengthened mucro, and simulating *P. crinita* is common on the limestone at Backbury hill, and near Fownhope.

128. **Didymodon rubellus.** 1, 2. 3, 4, 7, 11, 12, 13, 14. Widely scattered and ubiquitous in its habits, but not very abundant except on the limestone. Pembridge, *Crouch.* Willow boles, King's Capel, *Ley.* Great Doward, plentiful, *Ley.* Mountain rocks, Llanthony District, plentiful, *Ley.*

129. **Didymodon luridus.** 1, 2, 3, 7. Limestone. Backbury hill, *Ley.* Great Doward, fruiting, 1877, *Ley.* Common on muddy stones by the Wye, Breinton; Sellack; near How Capel in fine fruit, 1877, *Ley.* In fine fruit at the Bark-rick, Hoarwithy, December, 1879, *Ley.*

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132. **Didymodon sinuosus.** 1, 2, 3, 7. 13, 14. Damp stones at the base of walls, &c., not rare. Easily known by its fragile leaves. Banks of the Honddu, Llanthony, 1874. Wall of St. Weonard's Church. Wall-top, Great Doward; stones, Breinton, and King's Capel, 1877, *Ley*. Whitfield, on an oak bole, 1877, *Ley*.

134. **Eucladium verticillatum.** 2, 7, 8. Rocks and quarry sides where irrigated by an ooze of water; conspicuous from its metallic green foliage. Dripping rocks, Great Doward, in plenty. Brobury Scaur, and similar rocks above Breinton, on the Wye. Damp quarry, Fawley, *Ley*. In plentiful fruit, in the petrifying rill at Brobury Scaur, August, 1880, *Ley*. In fruit, with *Barbula rigidula*, at Great Doward, March, 1877, *Ley*.

136. **Ditrichum homomallum.** 2, 11, 14. Banks in hilly parts, not common. Lyonshall Park, *Crouch*. Plentiful at Harechurch, Hope Mansel, 1874, *Ley*. Summit of the Hatterel range, Llanthony, 1874, *Ley*.

137. **Ditrichum flexicaule.** 2, 3, 4, 13, 14. Open hills, chiefly on the limestone. Checkley Common, *Crouch*. Hills above Dormington, *Ley*. Great Doward, *Ley*. Mountain sides, Llanthony, *Ley*.

141. **Trichostomum tophaceum.** 2, 3, 7. 14. Quarries, railway cuttings, &c., common. Railway cutting at Fawley station, fruiting, *Ley*. Rocks and stones by the banks of the Wye, mostly barren. Banks of the Honddu, Llanthony, fruiting, *Ley*.

142. **Trichostomum mutabile.** 1, 2, 3, 10, 14. Walls and shady banks, on sand and limestone. Backbury hill, and Bridstow, near Ross, under old hedges, barren, *Ley*. Lord's wood, Great Doward, barren, *Ley*. Stone near Hole-in-the-Wall, Foy, fruiting, *Ley*. Not uncommon.

143. **Trichostomum crispulum.** 2. Rare; limestone. Plentiful in the large quarry, Great Doward; in fine fruit there, May, 1877, *Ley*. Small quarry, Caplar, April 3, 1880, *Ley*.

145. **Trichostomum nitidum.** 2, 14. Rocks; rare. Limestone rocks, Great Doward, 1877, *Ley*. Cwm Bwchel, Llanthony, 1877, *Ley*.

149. **Barbula ambigua.** 1, 2, 3, 7, 8, 11. 12, 13. Mortar of walls, and on marly banks, common. Pembridge, *Crouch*. Wall, Hereford; wall-top, Sellack; road bank, Tretire; railway cutting, Fawley, *Ley*.

150. **Barbula aloides.** 1, 2, 3, 7, 8, 10, 11, 12, 13. Habits, &c., of the last, the two often growing together in a puzzling manner. Pembridge, *Crouch*. Marly quarries, Caplar; Fawley station, *Ley*. This species seems far more abundant, though not more widely distributed, in our neighbourhood, than its congener, *B. ambigua*. Marly banks will be found bearing a thick crop of *B. aloides*, among which scattered specimens of *B. ambigua* will be picked out by means of their erect capsule and broader leaves.

156. **Barbula marginata.** 2. Sandstone faces where decaying and shaded. Not uncommon in the Ross District. Lane bank, King's Capel; old

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quarry, Sellack; exceedingly fine. Stone, Great Doward (limestone), 1877, *Ley*. An interesting plant which ought to be looked for in other parts of the county. In Oxfordshire, Mr. Boswell informs me that it is confined to the damp walls of old churches; there are some in Herefordshire in a state of damp and decay, which the bryologist ought to search before they undergo restoration.

158. **Barbula muralis.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Ubiquitous on walls. Pembridge, *Crouch*. Sellack, *Ley*.

The variety *rupestris*, *Wils.*, is common on the limestone rocks of the Great Doward. Wall-top, Kingsland, 1876, *Ley*.

159. **Barbula unguiculata.** 1. 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Very frequent and not at all particular in its habitats. Pembridge, *Crouch*. Sellack, *Ley*. Generally to be found, if looked for, within a few yards of any spot where the collector is standing.

160. **Barbula fallax.** 1, 2, 3, 11, 13. Not rare. Titley, *Crouch*. Limestone of the Great Doward, *Ley*. Variety *brevifolia*. Lane banks, Backbury and Aymestry, 1876, *Ley*.

161. **Barbula recurvifolia.** 2. Limestone; rare. One spot in the large quarry, Great Doward; barren, *Ley*. In fruit, small quarry, Caplar, April 3, 1880, *Ley*.

163. **Barbula rigidula** (Didymodon). 2. Irrigated rocks, Great Doward, abundantly, *Watkins* and *Ley*. No other locality known in the District.

164. **Barbula spadicea.** 2. Limestone walls near the Summer House, Howle hill, February, 1880, *Ley*. Male plant.

165 **Barbula cylindrica.** 1, 2, 3, 7, 8, 9. Abundant in Herefordshire, in every sort of situation. Fruiting, on wall-tops, Aymestry; on stones and stumps in the river mud, Sellack and near Kentchurch; on garden paths, Sellack.

166. **Barbula vinealis.** 1, 2, 7, 10, 14. Hereford, collected by E. M. Holmes, Esq., October, 1879. Treago; base of cross, Sellack churchyard; railway cutting, Fawley station, abundantly; wall, Llanthony, *Ley*. All barren. Wall-top, near Mary Knowl, in fine fruit, October, 1880, *Ley*. Wall-tops, Wilton, near Ross, abundant but barren, November, 1880, *Ley*.

168. **Barbula revoluta.** 2, 8. Quite a rarity with us. Wall-top, Great Doward, May, 1873, *Ley*. I have not seen it since. Wall-top, Norton Canon, April 16, 1879, *Ley*. Barren, and in small quantities.

169. **Barbula convoluta.** 1, 2, 3, 8, 10, 11. Very abundant on wall tops; easily known by its minute leaves and long pale fruit stalk. Sellack, Breinton, Great Doward, *Ley*.

171. **Barbula tortuosa.** 1, 2, 14. Chiefly on the limestone, but not confined to it. Great Doward, abundant; fruiting underneath shade. Mountain

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rocks in the Llanthony District; barren. In small quantities; rocks, west ridge of Garway hill; barren, *Ley*.

175. **Barbula Brebissoni.** 1. Tree stumps along the course of the Monnow below Pontrilas; frequent and fruiting freely, *Ley*. Not yet found on the Wye. Stumps on the Garron, near St. Weonards, *Ley*, 1878.

176. **Barbula subulata.** 1, 2, 7, 8, 10, 11, 12, 14. Banks and rocks; common. Pembridge, *Crouch*. Sellack, *Ley*. A large variety, frequent on stumps along the river banks. Near Kentchurch on the Monnow; Sellack on the Wye, *Ley*.

177. **Barbula lævipila.** 1, 2, 3, 4, 7. 8. 10, 12, 14. Tree stumps, frequent. Pembridge, *Crouch*. Sellack, Breinton, near Kentchurch, &c., *Ley*.

178. **Barbula latifolia.** 1, 2, 7, 12. Damp stumps. Pembridge, *Crouch*. Abundant on the banks of the Wye in the Ross District, occasionally in fruit, *Ley*. On the Monnow near Kentchurch, *Ley*. Fruiting (one old capsule); trees, river side, Hunderton, near Hereford, February, 1881, *Ley*.

179. **Barbula ruralis.** 1, 2, 3, 7, 10, 12. Thatched roofs, &c. Pembridge, *Crouch*. On roofs, at Penalt, King's Capel, 1880, *Ley*.

180. **Barbula intermedia.** 1. 2, 3, 11, 14. Frequent in the limestone districts. Great Doward, Backbury Hill, *Ley*. Quite as frequent as *B. ruralis* on sandstone wall tops, &c. Ashe, King's Capel, &c., *Ley*.

181. **Barbula papillosa.** 1, 2, 7, 12. Tree stumps, not infrequent. Pembridge, *Crouch*. Sellack, King's Capel, on oak, elm, and Lombardy poplar. *Ley*.

185. **Ceratodon purpureus.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 14. By no means the ubiquitous moss in our county which it becomes in hill districts. Pembridge, *Crouch*. Peterstow, *Ley*. Abundant on charcoal heaps, &c., Lord's Wood, Great Doward. Abundant in the Llanthony District, *Ley*.

189. **Encalypta vulgaris.** 1, 2, 3, 10. Wall tops (rather rare) on the sandstone; banks and rocks (frequent) on the limestone. Walls, Pencraig, *Watkins*. Churchyard wall, Hentland, *Ley*. The Cockshot, Marcle hill, and near Dormington, *Ley*. Abundant on the Dowards, *Ley*.

191. **Encalypta ciliata.** 14. Mountain rocks. Several spots in the Llanthony District. Red Daren, above Longtown, in fine fruit, May, 1873, *Ley*.

192. **Encalypta streptocarpa.** 1, 2, 4, 10, 14. Frequent on the limestone, rare on the sandstone, always barren. Aymestry, *Crouch*. Great Doward, *Ley*. Fruiting, on a bridge at Llanthony, April 9, 1880, *Ley*.

194. **Grimmia apocarpa.** 1, 2, 3, 4, 8, 10, 11, 12, 14. Rocks, frequent. Pembridge, *Crouch*. Sellack, *Ley*. Variety *gracilis*, *Schw.*, wood near Mordiford, pointed out to me by H. Boswell, Esq. Variety *rivularis*, *Schw.*, on stones by the river, Sellack, *Ley*.

198. **Grimmia orbicularis.** 2. Rare. Exposed limestone. Great Doward, 1877, *Ley*.

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199. **Grimmia pulvinata.** 1. 2. 3. 4. 7. 8. 10, 12. 14. Rocks and walls, very common. Pembridge, *Crouch.* Sellack, *Ley.*

206. **Grimmia trichophylla.** 1. 2. 7. 14. Stones and walls in hilly parts, not rare. Garway hill. Harechurch. Hope Mansel, and frequent in the Llanthony District, *Ley.* In fruit near Llanthony, 1877. *Ley.* Wall-top, Springfield, near Hereford, with *Racomitrium lanuginosum* and *Ptychomitrium polyphyllum*, *Ley.*

209. **Grimmia Donniana.** 14. Rare with us. Rocks at the summit of the Pfwddog, Llanthony, 1874, *Ley.* At the same spot again, 1880; confined to a single rock, *Ley.*

221. **Racomitrium aciculare.** 1, 14. Not common with us. Garway hill; Cusop hill, *Ley.* Frequent in the Llanthony valley, *Ley.*

224. **Racomitrium heterostichum,** var. **alopecurum.** 14. Stones on the summit of the Pfwddog, March, 1880, *Ley* (fide *Bosswell.*)

225. **Racomitrium fasciculare.** 1. 2, 8. 10, 14. Not common with us. Harechurch. Hope Mansel, *Ley.* Llanthony, common, *Ley.* On stone debris, in one spot, west ridge of hill running from Lady Lift to Garstone, October 2, 1879, *Ley.* Garway hill, March, 1880, *Ley.*

227. **Racomitrium lanuginosum.** 7, 14. In small quantities on a wall-top near Hereford, with *Brynm murale* and *Ptychomitrium polyphyllum*, 1887, *Ley.* Mountain rocks, Llanthony valley, March, 1880, *Ley.*

228. **Racomitrium canescens.** 3, 8, 14. Not common with us. Common-hill, Fownhope. Hills near Dinmore, *Ley.* Llanthony, common, *Ley.*

Var. **C. ericoides.** 14. Stones in the Grwyne, April 9, 1880, *Ley.*

230. **Ptychomitrium polyphyllum.** 1, 2, 7, 10, 11, 12, 14. Rocks and walls; scattered, but not abundant. Pembridge, *Crouch.* Great Doward, *Ley.* Wall-top near Hereford, *Ley.* Common in the Llanthony district, *Ley.* Stone, Penyard, 1879; wall-top, Welsh Newton Common, 1880, *Ley.* Walls and rocks, Warm hill; and between Egypt and the Summer House, 1880, *Ley.*

232. **Amphoridium Mougeotii.** 14. Common in the Llanthony district. Cwm Bwchel, Llanthony, in abundance, *Ley.* Absent, as far as I know, from the other Districts.

233. **Zygodon viridissimus.** 1, 2, 3, 7, 8, 14. Tree boles; abundant in South Herefordshire, especially on the apple. Sellack, in fruit, 1874; Peterstow, in fine fruit, 1876, *Ley.*

247. **Orthotrichum saxatile.** 1, 2, 3, 12. Rocks and walls, scattered and not rare, on limestone and sandstone. The White Rocks, Garway hill, *Ley.* Great Doward, *Ley.* St. Weonards; King's Capel; Fownhope, *Ley.* Pembridge, *Crouch.*

253. **Orthotrichum affine.** 1, 2, 3, 7, 10 12, 13. Abundant. Trees, especially the apple; sometimes on stones. Pembridge, *Crouch.* Sellack, *Ley.*

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260. **Orthotrichum tenellum.** 1, 2, 7, 8, 10, 12. Tree stumps, scattered; perhaps not rare. Pembridge, *Crouch.* Elm, Kentchurch, 1877, *Ley.* Elm, King's Capel; ash, near Hereford, 1877, *Ley.* Foxley Park, October, 1879, *Ley.*

262. **Orthotrichum diaphanum.** 1, 2, 3, 7, 12. Trees, abundant. Pembridge, *Crouch.* Sellack, *Ley.*

264. **Orthotrichum Lyellii.** 1, 2, 3, 4, 7, 8, 10, 12, 13, 14. Trees, especially selecting the Lombardy poplar. Pembridge, *Crouch.* Sellack, on apple, barren, *Ley.* King's Capel, on Lombardy poplar, fruiting, 1876, *Ley.* Abundant on oaks, Whitfield Park, fruiting, 1877, *Rev. T. T. Smith.* On oak, chestnut, &c., boles in Foxley Park, abundant and fruiting; October 2, 1879, *Ley.*

265. **Orthotrichum leiocarpum.** 1, 8, 12. Very rare. Pembridge, *Crouch.* A scrap brought away from a tree stump in Foxley Park, with *O. tenellum*, October, 1879, *Ley.* Old railing, St. Weonards, February 4th, 1881, *Ley.*

266. **Orthotrichum Sprucei.** 1, 2, 7. Willow stumps by the side of the rivers. Abundant by the Monnow near Kentchurch, *Ley.* By the Wye above Hereford, *Ley.* Abundant on the Wye at Sellack, *Ley.*

267. **Orthotrichum rivulare.** 1, 2, 7, 10, 12, 13. Stones and stumps along the rivers where covered with water during a good part of the year. More abundant in the smaller and rapid brooks than on the large rivers. Pembridge, *Crouch.* On the Monnow below Kentchurch, *Ley.* On the Wye, Sellack, *Ley.* Stumps on the Lugg (with *Barbula latifolia*); where the canal crosses it, July 28, 1879, *Ley.*

279. **Ephemerum serratum.** 2, 3. Probably often overlooked from its extreme minuteness. Banks, Sellack, in small quantities, 1872 and 1873, *Ley.* Wooded bank, Sufton, 1878, *Ley.*

283. **Physcomitrella patens.** 2, 3. Mud of dry pools, not rare. King's Capel, 1873; Benhall, near Ross, 1876; near the Hole-in-the-Wall, 1877, *Ley.*

285. **Physcomitrium pyriforme.** 1, 2 7, 12. Mud, and damp ditches, &c., not rare. Pembridge, *Crouch.* King's Capel, in two spots, *Ley.*

286. **Entosthodon ericetorum.** 2. Hilly woods, rare. Great Doward in Lord's Wood, 1873, and again 1877, plentifully, *Watkins, Ley.*

288. **Funaria fascicularis.** 1, 2, 7. Bare earth in clover and fallow fields, in the winter, common. Sellack; Wareham, near Hereford; Garway, *Ley.*

289. **Funaria calcarea.** 2, 3. On the limestone, rare. First found in Herefordshire by *Watkins* some years back. Road bank near Backbury hill, in small quantities. 1876, *Ley.* Summit of Little Doward hill in abundance, 1877, *Ley.*

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290. **Funaria hygrometrica.** 1, 2, 3, 8, 10, 11, 12, 14. Very common, and widely scattered. Very abundant where charcoal has been burnt in woods. Pembridge, *Crouch.* Sellack, *Ley.* Great Doward, *Ley.*

298. **Bartramia ithyphylla.** 11, 14. Hill-side rocks, rare. Hargest hill, Kington, *Crouch.* Mountain rocks near Llanthony, 1873 and 1876, *Ley.*

299. **Bartramia pomiformis.** 1, 2, 4, 7, 10, 11, 14. Scattered but not very common, in Herefordshire. Kington, *Crouch.* Hope Mansel, *Ley.* Broomy Rise, Eaton Bishop, *Ley.* Llanthony District, *Ley.*

300. **Bartramia Halleriana.** 14. Mountain side, rare. Cwm Bwchel, Llanthony, 1874 and 1877, *Ley.* At another spot just on the Breconshire border, 1877, *Ley.* Lower part of the Grwyne valley, 1880, *Ley.*

307. **Philonotis fontana.** 1, 2, 7, 11, 14. Common in the uplands, rare in the lower parts. Titley, *Crouch.* Wet spot by the Wye, near How Capel, barren, 1877, *Ley.* Llanthony District, common, *Ley.* River brink, at Breinton Common; July, 1877, *Ley.* Brought down from the higher districts of the river; as in the locality at How Capel, District 2? Not rare, about St. Weonards; barren.

309. **Philonotis calcarea.** 1, 2, 14. Springheads, &c., on mountains and hills. West side of Garway hill, 1875, *Ley.* Abundant, all through the Llanthony District; not rarely fruiting, *Ley.* Not advancing into the lowlands, as *Ph. fontana.* Bog (limestone) near Howle Green, February, 1880, *Ley.*

310. **Breutelia arcuata.** 14. Hill and mountain districts. Llanthony valley; Taren Esgob, Breconshire; Cwm Bwchel, Monmouthshire, *Ley.* Water-break-its-neck, Radnor, *Crouch, Ley.*

313. **Leptobryum pyriforme.** 2. Very rare. Covering two or three feet of a damp rock, Great Doward, 1873, *Ley.*

316. **Webera elongata.** 14. Tarens, Llanthony valley, Monmouthshire, April 8, 1880, *Ley.*

317. **Webera nutans.** 2, 7, 11, 14. Not common, except on the hills. Lyonshall Park, *Crouch.* Lord's wood, Great Doward, *Watkins, Ley.* Common on the Llanthony hills, *Ley.* Pool side, Peterstow, *Ley.*

318. **Webera cruda.** 10, 11, 14. Rare. Vallet's wood, Pembridge, *Crouch.* Rocky river bank, Downton, with the *Festuca sylvatica*, 1876, *Ley.*

319. **Webera annotina.** 1, 2, 14. Marly bank, at Fawley station; and S. Weonards; November, 1879; both barren, *Ley.*

321. **Webera carnea.** 1, 2, 3, 7, 8, 13. Earthy banks of slow streams, not rare. Kington, *Crouch.* Near Mordiford, 1876; near Garway, 1877, fruiting. Fallow field, Sellack, 1872, fruiting, *Ley.* River side, Sellack, abundant, but barren, 1877, *Ley.* Mud of road side, near Norton Canon; open field, and hedge bank, Preston-on-Wye, 1879; hedge bank, Tretire, 1880, *Ley.*

322. **Webera albicans.** 1, 2, 3, 11, 12, 13. Pool sides, bare earth,

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&c., abundant, but barren. Titley cutting, *Crouch.* Sellack, on garden paths, *Ley.* King's Capel, on pool mud, 1876, *Ley.*

323. **Zieria julacea.** 14. Tarens, Llanthony valley, within the Monmouthshire border, April, 1880, *Ley.*

325. **Bryum pendulum.** 10. Rare. River side, Byton, *Crouch.*

326. **Bryum inclinatum.** 3, 11. King's wood, Kington, *Crouch.* Wall near Mordiford, 1876, *Ley.*

329. **Bryum Barnesi.** 1, 2, 7. A barren *Bryum* occurring on stones by the Wye at Breinton, Mr. Boswell informs me, is this plant. I have observed what I believe to be the same plant, at several spots by the Wye, near Sellack. Stump by the river, Carey Islands, April 3, 1880, *Ley.*

333. **Bryum intermedium.** 2. Not common. The Leys, near Monmouth, *Watkins.* Small quarry, Howle hill, May, 1880, *Ley.*

334. **Bryum bimum.** 2. Wet places; rare. In the railway cutting above Fawley station, abundantly, 1874, *Ley.*

338. **Bryum erythrocarpum.** 1, 2, 3, 7, 11, 12. Wall-tops, quarries, &c.; not rare. Pembridge, *Crouch.* Sellack; King's Capel; Breinton, *Ley.*

339. **Bryum murale.** 1, 7. Walls; probably not rare. Wall near Hereford, *Ley.* Aymestry, *Crouch.* Several spots near S. Weonards, 1879, 1880, *Ley.*

340. **Bryum atropurpureum.** 2. In woods, on the ground. Lord's wood, Great Doward, *Ley.*

343. **Bryum cæspiticium.** 1, 2. 3, 4, 7, 8, 10, 11, 12, 13, 14. Common everywhere. Pembridge, *Crouch.* Sellack, *Ley.* A curious variety, probably *g. imbricatum, Wils.*, occurs on the Little Doward Hill, *Ley.*

345. **Bryum argenteum.** 1, 2, 3, 7, 8, 11, 12, 13, 14. Walls, &c.; common. Pembridge, *Crouch.* Sellack, *Ley.* A variety equalling *majus Schw.* in size, but with pointed leaves on a shady roof, Breinton, November, 1878, *Ley.*

346. **Bryum capillare.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Common on walls and rocks. Pembridge, *Crouch.* Sellack, *Ley.*

350. **Bryum pallens.** 1, 7, 14. Abundant in the Llanthony District. Cwm Bwchel, Llanthony, *Ley.* Wooded wet bank, Broomy Rise near Eaton Bishop, April, 1879; marshy spot by the Gamber, below Tretire, with young fruit, April, 1880, *Ley.*

353. **Bryum pseudotriquetrum.** 1, 2, 7, 11, 12, 14. Marshy spots, common. Shobdon Marsh, *Crouch.* Bog, Great Doward and Coppet hill, in fruit, *Ley.* Llanthony District, abundant, but usually barren, *Ley.*

357. **Bryum roseum.** 2, 11, 12. Woods; not common. Peas Grove, Kington, *Crouch.* Carey woods, *Ley.*

358. **Bryum filiforme.** 14. Mountain rocks, very rare. Llanthony valley, on the Breconshire border, a single specimen, 1873, *Ley.*

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361. **Mnium cuspidatum.** 2, 10. River-side, Byton, *Crouch.* Lord's wood, Great Doward, *Ley.*

362. **Mnium affine.** 1, 2, 7. Boggy spots and river banks, common. Boggy copse, near Eaton Bishop, *Ley.* River bank, Skenfrith. 1880; river bank, Sellack, *Ley.* Barren.

363. **Mnium undulatum.** 1, 2, 3, 7, 8, 11, 12, 13, 14. Woods and banks, abundant in the barren state. In fruit, in King's Capel churchyard, 1874, *Ley;* and in the Great Doward woods, 1874, *Ley.*

364. **Mnium rostratum.** 1, 2, 7, 12, 14. Common in woods and fruiting more freely than the last. Pembridge, *Crouch.* Fruiting in the Doward woods, and in Cwm Bwchel, Llanthony, *Ley.*

365. **Mnium hornum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Very abundant all through Herefordshire. Banks, woods, &c. Pembridge, *Crouch.* Hope Mansel, Penyard, and Doward woods, *Ley.*

366. **Mnium serratum.** 1, 2, 7, 12, 14. River banks; chiefly along the smaller and swiftly flowing streams. Pembridge, *Crouch.* On the Monnow, below Kentchurch, fruiting, *Ley.* Great Doward by the Wye, barren, *Ley.* Not common. With *Bryum pallens*, at Broomy Rise, in fine fruit, April, 1879, *Ley.* At the same spot, *Mnium rostratum* and *punctatum*, fruiting. Banks of the Grwyne, near Pont-y-spig; Tarens, Llanthony valley, April, 1880, *Ley.*

370. **Mnium stellare.** 1, 2, 7, 8, 9, 12, 14. Shady rocks and lane sides, sandstone and limestone, always barren. Abundant in Herefordshire. Pembridge, *Crouch.* Sellack; Orcop; Great Doward, *Ley.*

372. **Mnium punctatum.** 1, 2, 7, 10, 11, 14. Woods, rocks, and in marshes, common. Brook-side Pembridge, *Crouch.* Penyard woods, *Ley.* Bog at the Great Doward, *Ley.* Cwm Bwchel, Llanthony, *Ley.*

374. **Aulacomnium androgynum.** 2, 10, 11. Rocks and in hollow trees, not common. Near Hunton and Titley bridges, *Crouch.* Hollow willow, Aymestry, *Ley.* Rocks, Harechurch bank, Hope Mansel, *Ley.*

375. **Aulacomnium palustre.** 1, 11, 14. Wet moorlands, common, fruit rare. Park-gate, Lyonshall, *Crouch.* Ffwddog, Llanthony, barren, *Ley.* In abundant fruit at Trelleck bog, Monmouthshire, *Ley.* Welsh Newton Common, barren, September, 1879. On the Ffwddog, with young fruit, April, 1880, *Ley.*

378. **Tetraphis pellucida.** 2, 11, 12. Rocks and decaying stumps in woods, common, fruit rare. Vallets wood, Pembridge, in fruit, on a stump, *Crouch.* Penyard and Hope Mansel woods, plentiful on rocks, barren, *Ley.*

381. **Atrichum undulatum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Abundant everywhere. Pembridge, *Crouch.* Sellack, *Ley.*

385. **Pogonatum nanum.** 1, 2, 3, 8, 10, 11, 12. Banks, not very common. Grove wood, Pembridge, *Crouch.* Sellack, 1874, *Ley.* Garway hill,

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1875, *Ley*. Bare spot in turf, Lady Lift, October 2, 1879, *Ley*. Lane bank, S. Weonards, October 8, 1879, *Ley*.

386. **Pogonatum aloides**. 1, 2, 3, 4, 8, 11, 12, 14. Woods and banks, common. Grove Wood, Pembridge, *Crouch*. Great Doward, *Ley*.

387. **Pogonatum urnigerum**. 10, 11, 14. Banks, &c., chiefly on the mountains. Noke-lane, Pembridge, *Crouch*. Llanthony valley, on the Breconshire border, 1873, *Ley*.

391. **Polytrichum formosum**. 1, 2, 3, 4, 8, 10, 11, 13, 14. Woods, chiefly in hilly parts, abundant. Grove wood, Pembridge, *Crouch*. Hills above Stoke Edith, *Ley*. Hope Mansel woods, *Ley*.

392. **Polytrichum piliferum**. 1, 2, 11, 12, 14. Banks, turfy wall-tops, &c., in hilly districts, common. Bradnor wood, Kington, *Crouch*. Great Doward, *Ley*. Garway hill, *Ley*.

393. **Polytrichum juniperinum**. 1, 2, 8, 11. In the same situations as the last, common. Bradnor wood, Kington, *Crouch*. Great Doward, *Ley*. Ridge of hill, near Lady Lift, in small quantity, October 2, 1879, *Ley*

395. **Polytrichum commune**. 1, 11, 14. Moorlands, abundant. Lyonshall, *Crouch*. Llanthony District, *Ley*. Welsh Newton Common, in plenty, September, 1879, *Ley*.

396. **Diphyscium foliosum**. 11, 14. Hilly banks and woods. Bradnor wood, Kington, *Crouch*. Several spots in the Llanthony District. Cwm Bwchel, 1874; hill-side, on the Breconshire border, 1873, *Ley*.

399. **Fissidens bryoides**. 1, 2, 3, 10, 11, 12, 14. Banks, &c., abundant. Pembridge, *Crouch*. Sellack, *Ley*.

400. **Fissidens exilis**. 1, 2, 7. Banks, rare. Bank, Sellack, 1876 and 1877, *Ley*. Bank, Breinton, March, 1880; bank, Pembridge Castle, 1879, *Ley*.

401. **Fissidens incurvus**. 2, 3, 7. Woods and banks, rare. Sellack, 1877, *Ley*. Wood, Buckenhill, 1877, *Ley*. Bank, Breinton, March, 1880, *Ley*.

402. **Fissidens viridulus**. 1, 2, 3, 7, 8, 12. Banks and woods, rare. Pembridge, *Crouch*. Larkhill wood, near Weobley, *Ley*. Hedge bank, Kivernoll, near Much Dewchurch; wood bank, Breinton, 1880, *Ley*.

Var. **Lylei**. Lane banks, common in South Herefordshire. King's Capel, abundant, *Ley*. Wood near Caldecot, Little Dewchurch, 1876; Buckenhill, 1877, *Ley*.

405. **Fissidens crassipes**. 2, 7, 10. Sluices, stones in streams, &c. Not common. Stream near Eaton Bishop, 1873, *Ley*. Iron mill-wheel near Hoarwithy, and in the Wye, Sellack, *Ley*.

409. **Fissidens adiantoides**. 1, 2, 3, 11, 14. Bogs, common; and on mountain rocks. Lyonshall, *Crouch*. Bog, Great Doward, *Ley*. Hill-sides, Llanthony, *Ley*. Garway hill, *Ley*. Quarry, Sufton, *Ley*.

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410. **Fissidens taxifolius.** 1, 2, 3, 7, 8, 10, 11, 12, 13, 14. Woods, hedge-banks, bare earth, &c., everywhere abundant. Pembridge, *Crouch.* Sellack, *Ley.*

412. **Schistostega osmundacea.** 2. Hollow banks and caves, on a light soil, rare. Harechurch bank, Hope Mansel, in two spots, 1873, 1876, *Ley.*

414. **Cinclidotus fontinaloides.** 1, 2, 7, 10, 11, 12, 13, 14. In streams, common. Leather mill, Pembridge, *Crouch.* In the Monnow, Kentchurch; in the Wye, Sellack, *Ley.*

415. **Fontinalis antipyretica.** 1, 2, 7, 10, 12, 13, 14. Rivers and pools, abundant, fruit rare. In the Arrow, Pembridge, *Crouch.* In the Wye, Sellack, *Ley.* Once in fruit in a pool at Llangarren, *Watkins.* Once in a pool at King's Capel, *Ley*, 1875.

416. **Fontinalis squamosa.** 2, 7, 13. Mountain streamlets. In the Wye, Breinton, abundantly, 1874, *Ley.* In the Wye, Sellack, very sparingly, 1876. Barren. Stones, river bank, Breinton, in plenty. Moccas Park, in the river, 1879, *Ley.*

418. **Hedwigia ciliata.** 1, 2, 11. Rocks, not common. Bradnor hill, Kington, *Crouch.* Garway hill, 1875, *Ley.* Huntsham hill, *Ley.* Rocks, Coppet hill, in small quantity, June, 1880, *Ley.*

420. **Cryphæa heteromalla.** 1, 2. Rare. A single piece on a tree-root, Sellack, 1877, *Ley.* Elm stump, St. Weonards, 1879, *Ley.* Elm stump, Fishpool, St. Weonards, in small quantities, February, 1881, *Ley.*

422. **Leucodon sciuroides.** 1, 2, 3, 4, 7, 10, 12, 14. On stumps, abundant, but always barren. Pembridge, *Crouch.* Sellack, *Ley.*

424. **Antitrichia curtipendula.** 12, 14. Very rare. Pembridge, in small quantities. *Crouch.* Old wall between the Queen's Head and Pont-y-spig, April 8, 1880, *Ley.* Barren.

426. **Neckera pumila.** 3. On one tree (Elm) in the wood crowning the Cockshot, Stoke Edith, December 1880, *Ley.* Not in fruit.

427. **Neckera crispa.** 1, 2, 14. Not common. Limestone on the Great Doward, where it appears starved and small; mountain rocks in the Llanthony valley, abundant, several times in fruit, *Ley.* Fruiting at Water-break-its-neck, Radnor, 1874, *Ley.* Fruiting, on rocks in a shady wood (limestone) Coppet hill; abundantly, near the quarries, Great Doward, 1880, *Ley.* On a rock with *H. molluscum* and *Brachythecium plumosum*, western ridge of Garway hill. These three plants and others (*Seligeria recurvata*, *Bartramia calcarea*, and *Hypnum falcatum*) quite recall the Llanthony hill-sides. Caplar, April, 1880, *Ley.* Very fine, and with abundant empty capsules and immature setæ; rocks near the quarry, Great Doward, July, 1880, *Ley.*

428. **Neckera complanata.** 1, 2, 3, 4, 7, 8, 9, 10, 11, 12, 14. Tree stumps, roots, and rocks. Abundant, fruit rare. Pembridge, *Crouch.* Sollers-

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hope, &c., *Ley*. In fruit on limestone rock at Aymestry, 1876, *Ley*. Fruiting, 1879, and again, 1880, on a shady wall near St. Weonards, *Ley*.

429. **Homalia trichomanoides.** 1, 2, 3, 4, 7, 8, 10, 12. Damp tree stumps, common, the fruit abundant. Pembridge, *Crouch*. Caplar, *Ley*.

432. **Pterygophyllum lucens.** 8. Wet shady spots. Very rare in the county. Streamlet close beside Dinmore station, *T. Walker, Esq.*, October 1878. In Llanthony valley, just across our boundary, 1873, *Ley*.

437. **Leskea polycarpa.** 1, 2, 7, 10, 12. Damp stumps, roots, and rocks, chiefly on the river banks, abundant. Pembridge, *Crouch*. Along the banks of the Wye, Sellack, *Ley*. On the Monnow below Kentchurch, *Ley*.

440. **Anomodon viticulosus.** 1, 2, 3, 8, 10, 12, 14. Rocks and stumps, under shade, abundant, but mostly barren. Pembridge, *Crouch*. Sellack, in fruit, on a fallen stump in a wood, 1873; Caplar, fruiting, upon sandstone rock, 1872; Great Doward, fruiting in abundance upon shady limestone every year, *Ley*. In plentiful fruit on a stump by the Garron, St. Weonards, January, 1880, *Ley*. Similarly by the Monnow, April, 1880, *Ley*.

444. **Heterocladium heteropterum.** 11, 14. Rocks, rare. Lyonshall, *Crouch*. Mountain rocks in the Llanthony valley, just over the Breconshire border, 1873, *Ley*. Barren with us. Tarens, Llanthony valley, within our borders, April, 1880, *Ley*.

446. **Thuidium tamariscinum.** 1, 2, 3, 4, 8, 10, 11, 12, 13, 14. Woods and banks, abundant, fruit rare. Pembridge, *Crouch*. In fruit at Harechurch, Hope Mansel, 1873, *Ley*. In Carey woods, 1872, *Ley*.

451. **Pterogonium gracile.** 1, 2, 10. Rocks in hilly districts, not common. White Rocks, Garway hill, 1875, abundant, *Ley*. Near the Buckstane, West Gloucester, *Ley*. Barren. Rocks, Coppet hill, in small quantity, June, 1880, *Ley*. On an oak stump, ridge of the hill looking south. between Foxley and Lady Lift, only observed on one tree, October 2, 1879, *Ley*. Abundant, and fruiting at Stanner Rock, Radnorshire.

453. **Thamnium alopecurum.** 1, 2, 8, 10, 12, 14. Damp shady rocks, not uncommon, rare with fruit. Pembridge, *Crouch*. Caplar, in fruit, 1872; Cwm Bwchel, in fruit, Llanthony, 1874; Great Doward, in plentiful fruit, 1877, *Ley*. Streamlet, near Dinmore, fruiting. October, 1878, *T. Walker, Esq.*

454. **Climacium dendroides.** 2, 7, 12. Damp meadows and bogs, not abundant, and usually stunted, in Herefordshire. Pembridge, *Crouch*. Pengethley, *Watkins*. Abbot's meadow, near Ross; and the bog, Great Doward, *Ley*. Barren. Broomy Rise, Eaton Bishop, with *Mnium serratum*, 1879, *Ley*.

456. **Isothecium myurum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Banks, &c., not rare. Pembridge, *Crouch*. Breinton; Garway hill; summit of the Ffwddog, Llanthony, *Ley*.

457. **Orthothecium intricatum.** 14. Olchon dingle, 1881, *Ley*.

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On Taren Esgob, Breconshire, April, 1880, *Ley*. Ought to be found in the Monmouthshire part of the Llanthony valley.

459. **Homalothecium sericeum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 14. Trees and rocks, abundant; fruit not rare. Pembridge, *Crouch*. King's Capel, fruiting, *Ley*. Fruit common on the limestone of the Great Doward, *Ley*.

460. **Camptothecium lutescens.** 2, 3, 6, 7, 10, 13. Open hilly ground, especially upon limestone, where it is abundant. Dormington, *Crouch*. In fruit at Caplar quarry (sandstone), 1872; and abundantly upon the Great Doward, *Ley*.

462. **Scleropodium cæspitosum.** 1, 2. Stumps and stones near water, rare. By the Monnow, below Kentchurch, 1877, *Ley*. By the Wye, King's Capel, *Ley*. Fruit not yet found. Pool-brink, Poulstone, King's Capel, fruiting (a single capsule), *Ley*, 1879.

463. **Scleropodium illecebrum.** 1, 2, 3, 7, 8, 10, 12, 13. Rocky lane banks and bare marly ground, not rare. Kingsland, *Crouch*. Underneath trees, hill above Stoke Edith, 1874, *Ley*. Treago, 1877, *Ley*. Broomy Rise, near Eaton Bishop, 1877, *Ley*. Abundant in King's Capel, where it fruited in 1876-7, *Ley*. Fruit rare. In fruit on shady limestone, Downton, 1877, *Ley*. Dinmore hill, and Foxley Park (on a stump), barren; one or two capsules, hedge bank, Treago, March, 1880, *Ley*.

466. **Brachythecium glareosum.** 1, 2, 3, 10, 13. Stones and hedgebanks, chiefly on sandstone, common. Byton, *Crouch*. Sellack, *Ley*. Not found in fruit. Adam's rocks, sparingly in fruit, December, 1880, *Ley*.

468. **Brachythecium albicans.** 1, 3, 10. Open hills, in turf; rare with us, Backbury hill, 1876, *Ley*. Shobdon hill, 1876, *Ley*. On Mitcheldean Meend, and in other spots in the Forest of Dean, *Ley*. Trelleck bog, Monmouthshire, *Watkins*. Not found in fruit. The Northgate, St. Weonards, 1878, *Ley*.

469. **Brachythecium velutinum.** 1, 2, 3, 4, 8, 10, 11, 12, 14. Hedge banks, &c., plentiful. Lyonshall, *Crouch*. King's Capel, *Ley*.

473. **Brachythecium rutabulum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Abundant in every sort of situation. Pembridge, *Crouch*. Sellack, *Ley*.

475. **Brachythecium rivulare.** 2, 3, 7, 10, 12. Watery places, spring-heads, &c.; not, I believe, rare. Pembridge, *Crouch*. Peterstow; Eaton Bishop; Mordiford; Breinton, *Ley*.

476. **Brachythecium populeum.** 1, 2, 7, 8, 11, 14. Stones in shady woods, not common. Lyonshall, *Crouch*. Lord's wood, Great Doward, *Ley*. Near Llanvihangel; Broomy Rise, Eaton Bishop; Lady Lift, *Ley*. Wood above the Scinchill, Llanrothal, abundant, *Ley*.

477. **Brachythecium plumosum.** 1, 2, 12, 14. Banks, &c., chiefly in the hills. Pembridge, *Cvouch*. Stones, King's Capel, 1871, *Ley*. Garway hill, and plentiful on the mountain sides in the Llanthony District, *Ley*.

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478. **Eurhynchium myosuroides.** 2, 3, 7, 8, 13. Stones in shady woods, common. Penyard and Hope Mansel woods, *Ley.* Huntsham, *Ley.*

480. **Eurhynchium circinatum.** 2. Limestone rocks, rare. Rock at the Great Doward, 1877, *Ley.* Limestone rocks below Tintern, on the Gloucestershire bank of the river, 1877, *Ley.*

482. **Eurhynchium striatum.** 1, 2, 3, 7, 10, 11, 12, 13, 14. Hedge-banks, woods, &c., abundant, and fruiting freely. Grove wood, Pembridge, *Crouch.* Caplar, *Ley.*

483. **Eurhynchium crassinervium.** 2, 10. Abundant on the limestone of the Wye valley, Welsh Bicknor, and Great Doward, *Ley.* Extending down to Llandogo (Monmouth) and Tintern (West Gloucester), *Ley.* Barren.

484. **Eurhynchium piliferum.** 1, 2, 3, 7, 8, 10. Hedges and damp banks, common, but barren. Sellack, King's Capel, near Tretire, Breinton, *Ley.*

487. **Eurhynchium Swartzii.** 1, 2, 3, 7, 10, 11, 12. Abundant, on hedge banks, in quarries, open fields, &c.; barren. Pembridge, *Crouch.* Sellack, *Ley.* Fruiting; lane banks, St. Weonards, February, 1881, *Ley.* Wood, Broomy Rise, Eaton Bishop, fruiting, March, 1879, *Ley.*

488. **Eurhynchium prælongum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Abundant and ubiquitous. Grove wood, Pembridge, *Crouch.* Sellack, *Ley.*

489. **Eurhynchium pumilum.** 1, 2, 6, 8. Hedge banks, &c., not rare; fruit not unfrequent. King's Capel, in fruit; Caplar, in fruit; Weobley, *Ley.*

490. **Eurhynchium Teesdalii.** 1, 14. Wet rocks, near cascades, &c. Rare. Cwm Bwchel, Llanthony, fruiting, 1877, *H. Boswell, Esq.*, and *Ley.* Stone in the Garron above Rhydicaer, St. Weonards, March, 1881, *Ley.*

492. **Rhynchostegium tenellum.** 1, 2. Rocks, chiefly on limestone. Great Doward, plentiful, *Watkins.* Fawley Chapel (sandstone), *Ley.* Sellack (sandstone); tufaceous rock, at the Darren, Skenfrith, 1880, *Ley.*

493. **Rhynchostegium depressum.** 2. Limestone rocks, under shade. Lord's wood, Great Doward, 1874, *Ley.* Bicknor woods, West Gloucester, 1876, *Ley.* Rare.

494. **Rhynchostegium confertum.** 1, 2, 3, 8, 12. Stones and hedge banks, common. Glewstone, *Watkins.* King's Capel, *Ley.*

496. **Rhynchostegium murale.** 1, 2, 3, 11, 14. Chiefly upon limestone walls. Bradnor wood, Kington, *Crouch.* Walls, Great Doward, plentiful, *Ley.* Muddy stones by the Wye; Sellack (sandstone), *Ley.*

Var. **complanatum.** Wall top, Rhydicaer, 1875, *Ley.* Named thus for me by Mr. Boswell.

497. **Rhynchostegium rusciforme.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 14. Stones in running streams, abundant. Pembridge, *Crouch.* In the Wye, Sellack; in the Pentelow brook, Mordiford; in the Garron, Treago, *Ley.*

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500. **Plagiothecium pulchellum.** 14. Tarens, Llanthony valley, Monmouthshire, April 8, 1880. *Ley.*

502. **Plagiothecium denticulatum.** 1. 2, 3, 4, 7, 10, 11, 14. Woods and rocks, plentiful. Grove wood, Pembridge, *Crouch.* Harechurch and Penyard woods, *Ley.*

503. **Plagiothecium elegans.** 2, 11, 12. Shady rocks, not common. Pembridge, *Crouch.* Harechurch, Hope Mansel, *Ley.*

504. **Plagiothecium sylvaticum.** 1, 2, 4, 7, 11, 12, 14. Woods; not rare with us. Pembridge, *Crouch.* Harechurch woods; Carey woods, *Ley.*

505. **Plagiothecium undulatum.** 2, 11, 12. Hilly woods, not frequent with us. Shobdon, *Crouch.* Harechurch woods, Hope Mansel, *Ley*; fruiting.

510. **Amblystegium serpens.** 1, 2, 3, 4, 7, 10, 11, 12, 14. Banks, stones, &c., very common. Pembridge, *Crouch.* King's Capel, *Ley.*

511. **Amblystegium radicale.** 2, 7, 11, 14. Stones in rills, rare. Pembridge, *Crouch.* Rill, Breinton; rill, near Eaton Bishop, *Ley.* Well side, Fawley, *Ley.* Rill, near Pont-y-spig, March, 1880, *Ley.*

512. **Amblystegium irriguum.** 2, 7, 11. Stones in rills, &c., rare. Lyonshall, *Crouch.* Breinton (with *A. radicale*), 1874, 1877, *Ley.* Stream below Hentland Church, February, 1880, *Ley.*

513. **Amblystegium fluviatile.** 1, 2, 7, 10, 12, 13, 14. Rills, rare. Leen Weir, Pembridge, *Crouch.* Stones, on the brink of the Wye, Moccas Park, April, 1879; in the Garron at the lower bridge, Treago, December, 1879; spring below Hentland Church; in the Grwyne, 1880, *Ley.* Cold spring under Breinton Camp, with *A. radicale*, June 5, 1879, *Ley.*

514. **Amblystegium riparium.** 1, 2, 7, 12. Base of stumps, &c., at pool sides, common. Pembridge, *Crouch.* Near Eaton Bishop, *Ley.* Pool side, King's Capel, *Ley.* In the Wye, Sellack, *Ley.*

515. **Hypnum aduncum** *(Kneiffii, Bry. Brit.).* 2, 7, 11. Pools, &c., rare. Vallet's wood, Pembridge, *Crouch.* Pool at Allensmore, 1874, *Ley.* Dry pool bed, Pengethley Park, February, 1880, *Ley.* Pool in a swampy meadow under Wareham, April 1879, *Ley.*

516. **Hypnum exannulatum.** 11. King's wood, Kington, *Crouch.*

521. **Hypnum revolvens.** 14. Bogs. On the Hatterels, Llanthony, 1874, *Ley.* Trelleck bog, Monmouthshire, *Ley.*

522. **Hypnum fluitans.** 1, 2, 11, 14. Bogs. Vallets wood, Pembridge, *Crouch.* Sellack, 1874, in small quantities, *Ley.* Hatterels, Llanthony, 1877, *Ley.* Welsh Newton Common, in small quantities; on the Ffwddog, abundant, 1880, *Ley.*

523. **Hypnum uncinatum.** 14. Mountain sides, among grass, Llanthony District. Cwm Bwchel, Llanthony, 1877, *Ley.*

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524. **Hypnum filicinum.** 1, 2, 3, 7, 8, 10, 11, 12, 13, 14. Streams and damp ground, very common. Shobdon marsh, *Crouch.* Sellack, *Ley.* Variety *vallis clausæ.* Lyonshall Park, *Crouch.* The very slender variety mentioned by Wilson, *Bry. Brit.*, grows in abundance on dry banks at Caplar quarry, *Ley.*

525. **Hypnum commutatum.** 1, 2, 7, 8, 11, 14. Streams, damp places, and irrigated rocks, common. Lyonshall, *Crouch.* Sellack, *Ley.* Large and fine, on wet limestone rocks at the Great Doward, and similarly at Llanthony, and at Taren Esgob Breconshire, *Ley.*

526. **Hypnum falcatum.** 1, 3, 14. Bogs and wet places. Spring heads in hill districts. Wet rock at the Darran, near Skenfrith, 1875, *Ley.* Very fine in a well near Mordiford, 1876, *Ley.* Garway hill; and plentiful on the Hatterels, Llanthony, *Ley.* Not in fruit. Fruiting in the upper part of the Honddu valley, Breconshire, 1877, *Ley.*

528. **Hypnum rugosum.** 2. Limestone ground, very rare. Exposed limestone ground, south face of the Great Doward, in small quantities, 1872, *Ley.*

535. **Hypnum cupressiforme.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Common and ubiquitous. Pembridge, *Crouch.* Great Doward, *Ley.* When growing on trees, it uniformly appears to grow from above downward.

Var. **compressum.** Pembridge, *Crouch.*

Var. **lacunosum.** Checkley Common, *Crouch.*

Var. **k, resupinatum.** 1, 2, 3, 7, 8, 10, 11, 12. 14. Grove wood, Pembridge, *Crouch.* Sellack, *Ley.* Common.

536. **Hypnum arcuatum.** 1, 2, 7, 8, 10, 11, 13, 14. Damp turf, not rare. Titley, *Crouch.* Clayey field near Kentchurch, 1877, *Ley.* By side of the Wye near How Capel, and again at Breinton, 1877, *Ley.* Downton, 1878, *Ley.* On a stump! river bank, Moccas Park, 1879; Northgate, and other places in St. Weonards, abundant, *Ley.* Barren. Rough mountain pasture, base of Crib-y-garth, June, 1880, *Ley.*

538. **Hypnum molluscum.** 1, 2, 3, 4, 7, 8, 10, 11, 13, 14. Banks and rocks, common on limestone, rare on sandstone. Aymestry, *Crouch.* Fruiting abundantly on the Great Doward, *Ley.* Caplar quarries (sandstone), *Ley.* Mountain sides, Llanthony valley (sandstone), *Ley.* Rock (sandstone), west edge of Garway hill, fruiting freely, 1880, *Ley.*

540. **Hypnum palustre.** 1, 2, 3, 7, 8, 12, 14. Damp stones, &c., most common among the hills. Pembridge, *Crouch.* By the Pentelow brook, near Mordiford, *Ley.* Stones along the banks of the Wye at Caplar, and in other spots in the Ross District, sparingly, *Ley.* Abundant in the Llanthony District, *Ley.*

Var. **subsphæricarpon.** Cwm Bwchel, Llanthony, abundantly, *Ley.* Banks of the Monnow, below Skenfrith, 1880, *Ley.* Damp rocks, Harechurch, Hope Mansel (small form), 1880, *Ley.*

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548. **Hypnum Sommerfelti.** 2. Rocks, &c., chiefly on limestone. Stones at the Great Doward, 1875, *Ley.* In fruit at the Great Doward, 1875, *Ley.* Trelleck bog, Monmouthshire, *Watkins.*

550. **Hypnum chrysophyllum.** 1, 2, 3, 8, 11. Fallow fields, especially on clay soil, common. Wapley hill, *Crouch.* Near Checkley, *Ley.* Caplar, *Ley.* Fruiting, on a wooded bank; hill above Stoke Edith Park, December, 1880, *Ley*

552. **Hypnum stellatum.** 1, 2, 3, 7, 8, 10, 11, 12, 13, 14. Rocks, &c., common. Shobdon Marsh, *Crouch.* Great Doward, *Ley.*

Var. **protensum.** Bog, Great Doward; bog on Coppet hill, *Ley.*

553. **Hypnum cordifolium.** 1, 7, 11. Marshes, not common. Kingswood Common, *Crouch.*

556. **Hypnum cuspidatum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Damp spots, frequent. Pembridge, *Crouch.* Sellack, *Ley.*

557. **Hypnum Schreberi.** 1, 2, 3, 8, 10, 11, 12, 13, 14. Grassy places in hill districts, common. Pembridge, *Crouch.* Harechurch, Hope Mansel; Cobrey, near Ross; Hatterel hills, Llanthony, *Ley.*

558. **Hypnum purum.** 1, 2, 3, 7, 8, 10, 11, 12, 13, 14. Turf, everywhere. Pembridge, *Crouch.* Fruit not common. In fruit at Sellack; Great Doward; and on the hills above Fownhope, *Ley.*

559. **Hypnum stramineum.** 1, 2, 11. Marshes, rare. Park Stile, Lyonshall, *Crouch.* Abbot's meadow, near Ross, barren, *Ley.* Damp hollow, Welsh Newton Common, September, 1880, *Ley.*

561. **Hypnum scorpioides.** 14. Rills on the Ffwddog, south face, August, 1880, *Ley.*

562. **Hylocomium splendens.** 1, 2, 3, 7, 8, 10, 11, 12, 13, 14. Wooded banks, common, fruit rare. Pembridge, *Crouch.* Harechurch, Hope Mansel, in fruit, 1872, *Ley.*

566. **Hylocomium squarrosum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. In turf, very common, fruit rare. Pembridge, *Crouch.* Sellack, fruiting freely, 1874 and 1875, *Ley.* Mountain sides in the Llanthony valley, in fruit, *Ley.* Marshy ground between the Queen's Head and Pont-y-spig, District 14, fruiting, April, 1880, *Ley.*

567. **Hylocomium loreum.** 2, 8. 10, 11, 13, 14. Hilly woods, not very common in Herefordshire. Lyonshall, in fruit, *Crouch.* Harechurch, Hope Mansel, barren, *Ley.* Cwm Bwchel, and other spots near Llanthony, barren, *Ley.* Woods, Whitfield, plentiful and fruiting, 1877, *Ley.* Dinmore and Lady Lift woods, plentiful but barren, October, 1879, *Ley.*

568. **Hylocomium triquetrum.** 1, 2, 3, 4, 7, 8, 10, 11, 12, 13, 14. Woods, abundant, fruit rare. Pembridge, *Crouch.* Carey woods, in fruit, 1872, *Ley.* Fruiting, Harechurch, Hope Mansel, February, 1880, *Ley.*

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Woolhope Naturalists' Field Club.

1879.

THE Annual Meeting of the Woolhope Naturalists' Field Club was held at the Club Room on Tuesday, April 15th. Present—Rev. H. W. Phillott, M.A., President; Dr. Bull, Mr. P. Ballard, Rev. W. Bowell, Mr. T. Cam, Dr. Chapman, Mr. T. Curley, Mr. J. Davies, Rev. A. Ley, Rev. J. J. Lomax, Rev. H. B. D. Marshall, Mr. J. Griffith Morris, Mr. H. C. Moore, Mr. W. A. Swinburne, Mr. J. R. Symonds, Mr. G. H. With, Mr. Theo. Lane, Secretary.

The financial statement was read and approved.

The dates and places of the Field Meetings for the year were fixed, namely:—

Friday, May 30.—Hay, for Rhos Goch and Pains Castle.
Friday, June 27.—Kington, for Water-break-its-neck.
Tuesday, July 29 (Ladies' day).—Ludlow, for Downton.
Thursday, August 28.—Much Wenlock and the ruins of Buildwas Abbey.
Thursday, October 2nd.—Fungus foray.

The following gentlemen were then balloted for and elected as members of the Club:—Mr. Charles James Lilwall, Mr. George H. Hadfield, and the Rev. E. J. Holloway. Several other gentlemen were proposed.

The Meteorological Tables, with the rain-fall and register of flood-water on the Wye for the year 1878, were laid on the table, and it was resolved that the flood-register should be continued under the direction of Mr. Curley.

A resolution was then passed that the Presidents for the years 1877-8-9, with Dr. Chapman and the Secretary, should have full power to bring out the volumes of Transactions of the Club which are in arrear.

It was also resolved that the Central Committee, with the President and Secretary, should make the necessary arrangements for the Field Meetings not less than three weeks before the day.

The committee for "The Herefordshire Pomona" presented the financial statement for Part I., published last autumn, and exhibited the eight plates of coloured fruit which are already prepared for Part II. The committee reported that Part I. had been most cordially received by all the horticultural publications as a work that was very much wanted. They passed it the high compliment of

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stating that it ought to be called "The British Pomona" instead of "The Herefordshire Pomona." The committee did not, however, propose to change its name, but decided to make Part II. much larger than Part I.; so that, as would be seen by the plates, 41 different fruits would be given instead of 22 in Part I. In this way the work would be completed at a much earlier period. The subscription also to all who were not members of the Club must therefore be increased to £1 1s. per annum. The plates were beautifully executed, and like those in the first part, are so well done that the fruit seems to lie upon the paper. The great success of the beautiful work gives much satisfaction to the Club.

Mr. Ballard then exhibited some Roman and other objects of great interest, which were found in the neighbourhood of Hereford during the excavations for the canal, and a cordial vote of thanks was passed to him.

The meeting ended, the members adjourned to the Green Dragon Hotel, were they were joined by Rev. C. H. Bulmer, Rev. W. C. Fowle, Rev. C. E. Maddison Green, Mr. Haggard, Rev. Rees Price, Mr. J. F. Symonds, and other members, with their friends, to dine, and when the cloth was removed the President read his retiring address, and Dr. Bull afterwards read a "Sketch of the Life of Lord Scudamore," prepared for publication in Part II. of "The Herefordshire Pomona."

ADDRESS BY THE RETIRING PRESIDENT, REV. H. W. PHILLOTT, M.A.

APRIL 15TH, 1879.

IN delivering the valedictory address which the custom of the Woolhope Club requires from its retiring president, the first duty which he has this year to perform is the sorry one of making apology for his own neglect. We have all heard of the low value which is to be set upon a man who is good at this sort of work, and I fear that your out-going President has no right to claim exemption from the censure which that description implies. Permit me, however, to express my great regret that on two of the occasions on which the club went forth last year I was prevented by illness from joining them. The first of these, the expedition to the great landslip at Much Marcle, which goes by the name of the Wonder, and Kempley Church, was one possessing elements of very great interest—natural and antiquarian—and I may say that my own disappointment at being unable to join it was very great, more especially as for its first portion, the members were able to enjoy the services of so able and experienced a showman as Mr. Symonds, of Pendock. In the second, the visit to Kempley Church, the duty which would have fallen on myself to discharge if I had been present, was, I believe, efficiently fulfilled by my son, who read to the members present the very able and interest-

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ing description of the mural paintings in the church, drawn up by Mr. H. Middleton, architect, of Cheltenham, by whom they had been copied at the time when they were discovered. This paper has been subsequently printed in the *Journal of the Midland Institute*, and has probably been seen by some, at least, of our members present to-day. On this part of the day's proceedings I have no remark to add, but I may perhaps be forgiven if on the subject of the landslip I venture to make a few remarks, not at all of my own, but borrowed from other sources, and can only express the hope that there may be some of our members present to whom they are not already trite and familiar. It was in the year 1575 that, as old Camden tells us, the "hill called Marclay rose, as it were, from sleep, and for three days moved on its vast body with a horrible noise, driving everything before it to a higher ground, to the great astonishment of the beholders, by that kind of earthquake, I suppose, which naturalists call Brasmatia." On this description I will only remark that this last word is singularly inapplicable to the movement in question, for it is used by Aristotle (though not exactly in the form mentioned by Camden) to describe an earthquake with an up and down motion at right angles to the earth. Neither was the movement of the hill produced, I believe, by an earthquake at all, but was merely a landslip on an extensive scale, such as occur every winter on a smaller one in many of our Herefordshire banks, such as took place a year or two ago on one somewhat larger at Moccas; such slips as have taken place in the Isle of Wight from time to time, and of which I believe the latest took place in 1820, and which have produced the striking and picturesque scenery of the undercliff; and lastly, such as the one still more extensive, which took place in 1839 at Lyme, in Dorsetshire, whose effects I myself witnessed not long after its occurrence. As this is probably the largest slip which has taken place in this country within the recollection of most people now living, I may perhaps be pardoned if I inflict on the members now present a description of it, taken from a newspaper of the day, from which I possess a cutting. The writer says that he obtained his information from the farmer of part of the land, who told him that two of his labourers who occupied cottages on the cliff, when they had returned home from his house on Christmas Eve, perceived that the floors of their dwellings were slightly lifted, and that the ceilings had given way a little. Early next morning they were obliged to make a hasty retreat, as the land was evidently giving way fast, and about four or five o'clock on Thursday morning, more than 40 acres of ground on the ridge of the cliff parted from the main land, leaving a chasm in some parts more than 200 feet wide. Into this chasm several immense slices of the next fields soon afterwards slipped down, and others farther on were broken into fissures. Perhaps more than 150 acres of land were rendered useless; one of the cottages was moved from its position to a distance of 40 or 50 feet below, and of the other, though it was not removed, the floors were raised and the ceilings and roof were tumbling in. Near the spot many large elm trees were quite buried. The separated mass of earth, standing up in immense pillars torn asunder from each other, with the great chasm between it and the main land, presented a very grand appearance. On the Monday previous to the slip 300 sheep were feeding in the field afterwards destroyed, but

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not a single life either of man or beast was lost in the movement itself. The ground, extending from the base of the cliffs for about a quarter of a mile in extent, was moved forwards to the sea 10 or 15 feet, and in some places even further. The shingle beach was in several places tilted up at a considerable angle towards the cliff instead of towards the sea; and the bed of the sea several hundred yards out, and to a length of more than a quarter of a mile, was lifted up in a broken ridge of perhaps 40 feet in height, which enclosed several lakes of sea-water, which in some places was five fathoms deep. The foundation of this ridge is green-sand converted by the sea-water into mud, and it was strewed at the top with rocks and boulders covered with pink coral lines and dark seaweed. Immediately under the cliffs were several pools of fresh water. The land along the coast was disturbed to a distance of more than one and a half miles. The writer of this description thought, very justly, that this convulsion was not caused by an earthquake, and the tales of fire which at the time was said to have burst from the ground, may be set down as belonging to those tales of wonder which are usually rife on occasions like this. Instead of an earthquake, he thought that the slip was due to the wet, which after a very rainy season had filtered through the superincumbent chalk and sand to the blue lias clay below, and which, being thus loosened from its basis, slipped away and descended, thrusting forward the land in its front, and heaving up the ridge in the sea somewhat in the same manner as a moraine is thrust up by the pressure of a glacier. Probably the most extensive slip of this kind with which we are acquainted, is the one which took place in Switzerland in 1806, at the Rossberg, of which an excellent description may be read in Mr. Murray's Handbook, and of which the effects are very evident to any one who ascends the Rigi by the railway from Arth, on the lake of Zug. Nor is it difficult for those who perform this journey to foresee that similar disasters may take place hereafter in the same neighbourhood. Returning to Marcle Hill, we find that Fuller improves upon Camden's account by saying, that for three days the hill seemed to be in labour, shaking and roaring, to the great terror of all who heard or beheld it. It threw down all things that opposed it, and removed itself to a higher place. Baker says in his chronicle that a prodigious earthquake happened near a little town called Kynaston, in 1571 (not 1575). On Feb. 17th, at 6 p.m., the earth began to open, and the hill with a rock under it, making at first a great bellowing noise which was heard a great way off, lifted up itself to a great height, and began to travel, bearing along with it the trees that grew upon it, the sheep folds and flocks of sheep abiding there at the same time. In the place from whence it was first moved it left a gaping distance of 40 feet broad and 80 ells (300 feet) long. The whole field was about 20 acres. Passing along it overthrew a chapel standing in the way, removed a yew tree planted in the churchyard, from the west unto the east. With the like force it thrust before it highways, sheep-folds, hedges, and trees; making tilled ground pasture, and again turning pasture into tillage. Having walked in this sort from Saturday in the evening till Monday noon, it then stood still. I will only add that I believe the yew-tree here mentioned is still in existence, and that the bell of Kynaston

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Chapel was discovered some years ago, and is now preserved at Homme House, in the parish of Much Marcle.

The second meeting of the club at Ross was a very successful one, and the members who were present followed the course of the Wye either by rail, on foot, or by boat, visiting on their way the romantic scenery of Symond's Yat and the Doward caves, and returning by carriage to Ross.

Of the third meeting, at the Speech House, I can say nothing from my own knowledge, as I was again prevented by illness from attending it; but I was informed that, though agreeable and successful in other respects, the arrangements for dinner were defective.

The programme of the fourth meeting was certainly not less attractive than that of any of the other meetings, for it embraced both the park of Croft Castle, and the height of Croft Ambery, but only a few members found themselves able to attend the meeting. Those, however, who were able to do so, were well rewarded for their trouble. The noble site of the old encampment on the Ambery, the rich and varied landscape which its summit affords overlooking the Aymestry district, so rich in geological interest, the woodland beauties of the park, and the magnificent trees which in various parts it contains— oaks, chestnuts, larches, and other trees of remarkable size, form, and height; all these elements, together with the antiquarian interest belonging to the old Church of Croft, collected together a number of interesting objects which it would be difficult to find collected in any other part of the county; and, as the weather was favourable, I believe that the party who composed the expedition enjoyed the excursion thoroughly. Of the Fungus Foray I need say little or nothing, as the subject belongs so entirely and so justly to our friend Dr. Bull, except to notice the paper which was read by Mr. Ley, on that occasion, on the Mosses of Herefordshire, which showed so much industry and ability in its composition.

And here my function for the day might properly cease; but I must ask leave to say a few words on a subject which, though not scientific, has a connection with science; and in which some of the members of the Club may perhaps take an interest, and even exert a beneficial influence. I mean the process of extinction which, for purposes widely different in themselves, is carried on largely in the world, of objects of nature, both animate and inanimate, birds, animals, and plants. It is carried on for purposes of a scientific kind, and also for purposes which are rather the reverse of scientific. In the former class, what I have to say is rather by way of warning than of condemnation; and it amounts to this, that the great increase which has grown up in the present day of interest in natural objects, has led, and will, probably, lead still more extensively, to the formation of collections of objects connected with the study of natural history. But I would venture, with great humility, to ask whether there is not a danger of excessive multiplication of these collections. Of course we ought to have museums, both general and local, and to make them as complete as we can, and I know well the intense delight which collectors feel in acquiring and possessing specimens

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in their favourite subjects of study; but I venture to think that, as far as private collections are concerned, it is possible that there may be too many of them, and that the ambition of collectors to enrich their own cabinets and to distinguish themselves by the possession of rare specimens, tends to a depopulation in the sources of supply, which we have much reason to regret. When we hear that when such birds as the hoopoe, or the golden oriole, chance to visit the east or or south-east shores of our island, they are almost immediately shot down by some aspiring ornithologist in search of specimens for his private collection; when we find that almost as soon as the dwelling-place of some rare plant becomes known, it is forthwith invaded by a succession of collectors, each of them no less eager to secure his prize than to conceal his discovery, an endeavour which commonly ends in the revelation of the hiding-place, under a bond of secrecy, to some ingenuous friend, by whom the same process is repeated under similar conditions and with similar results; the systematic depredation which thus takes place, though full, no doubt, of credit to the fortunate few who enrich their private collections by its spoils, is fraught with disappointment to the many who feel no less interest in the treasure thus discovered and appropriated, than the discoverers themselves; and the public has reason to wish that the spirit of collection, which has thus become one of extirpation, were a little less widely diffused, and that collectors, who appear to pursue their object more in the spirit of relic-hunters than of students, would be content to expend their energies on objects more easily obtained or replaced than is the case with some of the plants or birds above mentioned. But there is also another and more powerful agency of destruction at work, in respect of birds and creatures supposed to be injurious to other birds or animals, or to the use and subsistence of men. I suppose that we have all heard of the ruthless persecution carried on against the poor harmless hedgehog, both by gamekeepers and by ignorant people in general; and some of us have probably seen the very sensible proclamation which was circulated some time ago in France, in which the favour of the public was invoked towards him as well as the toad, the mole, and small birds in general, as being, each of them, destroyers of insects, the real enemies of mankind.* I believe the toad, and in a great measure the hedgehog, to be guiltless

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*A SENSIBLE RURAL NOTICE.

In one respect at least the French are in advance of ourselves. They have learnt the value of birds, having discovered that whatever injury they may do to the fruit-trees is more than balanced by the service which they render in the destruction of insects. The following is the translation, as given in *Social Notes*, of a notice which has been put up in every commune in France:—

This board is placed under the direction of the common-sense and honesty of the public.

Hedgehog.—Lives upon mice, snails, and wire-worms, animals injurious to agriculture; don't kill a hedgehog.

Toad.—Helps agriculture; destroys twenty to thirty insects hourly; don't kill toads.

Mole.—Destroys wire-worms, larvæ, and insects injurious to the farmers; no trace of vegetable ever found in his stomach; does more good than harm; don't kill moles.

Cockchafer and its larvæ.—Deadly enemy to farmers; lays 70 to 100 eggs; kill the cockchafer.

Birds.—Each department of France loses yearly many millions of francs by the injury done by insects. Birds are the only enemies capable of battling with them victoriously. Birds are great helps to farmers. Chiidren, don't take birds' nests.

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of the charges commonly laid against them; but with respect to the mole, and to small birds in general, the truth, as in so many cases, lies in a mean between extremes. Though it is true that the mole delights not in vegetable but in animal food, his habits of life are often so troublesome to us, that we cannot wish his family to be more numerous than it is; and the same may be said of many small birds, whose appetites, though often exercised on noxious caterpillars and other foes to cultivation, are no less alive to the dainty food which our fruit trees and other plants provide for them in our gardens. But it is of the wholesale destruction, chiefly of the larger birds, by gamekeepers, that lovers of natural history have most reason to complain, and this, not only because there are fewer of them to be seen and admired, but for the purely utilitarian reason that by improving them from off the face of the earth, we have lost some of our best protectors against rats and mice, those deadly enemies of our prosperity, both in house and garden. I suppose that in most parts of our own county, the raven, if not altogether extinct, is at least extremely rare; the carrion crow, hawks, and owls of all kinds are not common; and even the beautiful kingfisher has become rare, I believe, on our rivers. The cause of this sweeping extermination has been, in a great measure, the antipathy of gamekeepers to all creatures which are believed, rightly or wrongly, to interfere with other creatures, including fish, whose lives are precious for the sake of their destruction at a later date in their existence. Some time ago I came across a list of birds destroyed on this principle on one estate in Scotland, between 1837—1840. The numbers amounted to 60 eagles; 1,758 hawks, kites, &c.; 1,912 crows and ravens; and 79 owls. Of course, as I said before, it is possible to have too many birds of these kinds as well as of the smaller, but it may be doubted whether the services of hawks and owls in destroying rats and mice, do not, at any rate in our own county, counter-balance the mischief with which they are debited in destruction of game or fish; whether the kingfisher be not better worth preserving than almost any amount of fish such as he devours, and whether it is not more pleasant sometimes and more instructive to study the habits, to listen to the voices, and to watch the movements of some of these wilder birds, than to consign them indiscriminately to destruction.

Poor kingfisher! his lot is indeed a hard one, for he is attacked both by his friends and by his enemies; by his friends for the sake of his brilliant plumage, so splendid, says Waterton, that even the tropics "do not present us with an azure more rich and lovely than that which adorns the back of this charming little bird," an ornament which makes him precious to bird collectors; and by his enemies, who shoot him or rob his nest because he is a lover of fish.

Something has been done by the law for the preservation of some birds, but I read that there are still barbarians who manage to evade the law in respect of the sea-birds, those chartered inhabitants of our rocky solitudes, rugged deserts which they make populous with their close-lying multitudes, soft with their downy plumage, and vocal with their shrill cries; while for all human purposes except that of decoration with their plundered feathers, they are absolutely worth-

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less. The appetite which leads men to take pleasure in shooting down these unoffending creatures—an appetite which led them in past days to bait bulls and badgers, and to set dogs and cocks to fight, and which still seeks for amusement of this kind in pigeon-matches—is by some, no doubt, called sport, but by others, among whom I must claim to reckon myself, a mere brutal lust of destruction. In this county, of course, there can be no shooting of sea-birds, but of reckless destruction such as I mentioned above, we cannot be called guiltless. The Woolhope Club would, I think, do good service if its members would assist in any way n retarding the further progress of the slaughter.

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Woolhope Naturalists' Field Club.

MAY 30th, 1879.

THE first meeting this year took place on Friday, May 30th. A small company left Barr's Court Station at 9.25 for Kington, where, upon assembling at the Oxford Arms Hotel, the business of the Club was transacted, and afterwards carriages were taken for Water-break-its-neck.

No record was taken of the company present, nor of the objects of interest on the route—which, according to the programme of the day, consisted of "The site of Radnor Castle—and the New Church, to see the effigies which lie on the floor under the tower; the remains of the western Town Wall; and a wide bank or mound on the right of the turnpike road, which is supposed to have been part of the boundary of Herefordshire until the time of Henry VIII."

Suffice it to say that the members enjoyed a charming pic-nic amidst delighful scenery, and after visiting the Waterfalls returned to a cold collation at the Oxford Arms, leaving Kington at 7.40 p.m. for Hereford.

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Woolhope Naturalists' Field Club.

JUNE 27th, 1879.

BUILDWAS AND WENLOCK.

THE members of the Woolhope Club held their second meeting on Friday, the 27th June, for the purpose of visiting Buildwas Abbey, and the still more celebrated ruins of the Priory of Much Wenlock. The route was a very long one, and the weather most unpromising. A wet night was followed by so cloudy a morning that the courage failed of many who had intended to be there. The excursion tickets led through Shrewsbury, where the train waited to take on the party to Buildwas, and this opportunity may be taken of naming the gentlemen who took part in the meeting:—The President, Mr. Arthur Armitage; the Rev. H. W. Phillott, Dr. Bull, Mr. W. A. Swinburne, Mr. T. Curley, Mr. J. G. Morris, Rev. G. H. Clay, Mr. Henry Southall, Mr. Henry Vevers, Rev. H. W. Tweed, Mr. Charles Fortey, Rev. C. J. Westropp, Mr. J. T. Owen Fowler, Mr. Joseph Carless, Rev. A. G. Jones, Mr. W. Lloyd, Mr. Henry P. Bull, and Mr. Theophilus Lane. The excursionists held on their way down the fertile valley of the river Severn, to

BUILDWAS OR BULDWAS ABBEY.

The ruins of Buildwas are situated on the south bank of the river Severn, about 11 miles from Shrewsbury. The Abbey was founded in 1135 by Roger de Clinton, Bishop of Chester. It was dedicated to St. Mary and St. Chad, and was first instituted for monks of the order of Savigny, who were afterwards united to the Cistercians. The church was originally built in the form of a cross, with a tower resting on arches between the nave and the choir. The side aisles, transepts, and chapels of the choir are in total ruin. The chapter-house is still perfect. It is a parallelogram of 43 by 33 feet, the roof of stone, supported by pillars with pointed arches. The abbot's house adjoining, is now converted into a most comfortable dwelling-house occupied by Mrs. Moseley, who most kindly gave permission for the members of the Club to visit it. It presents many objects of great interest, though we can only notice now the beautiful old encaustic tiles from the old abbey with which the hall is laid. They present a great variety of pattern, both inlaid and scored, and often of very elegant design. The abbey ruins are still very massive and picturesque. They are kept in excellent order, and are so well cared for, that if a means by which the very interesting chapter-house may be stayed from rapid decay is now pointed out, it is but offered as a tribute of

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admiration to the attention paid to the ruins, and of gratitude for the free permission to inspect them.

The abbey is built altogether of the New Red Sandstone, a kind of stone very liable to decay from moisture. It has suffered very much from the rain and rainspouts in many places. At this time the chapter-house is reeking with damp; its roof is dropping water, and its pillars are covered with green algæ, from the water so constantly running down them. On visiting the floor above the chapter-house, where the ancient dormitories are supposed to have been placed, it was found carefully paved with brick, to preserve the chapter-house roof; but the bricks are laid so low and so flat that there is no escape for the rain-water which falls upon its surface, and thus it has to soak its way through the roof, which, in the course of a very few years, it will inevitably cause to fall in. If the brick flooring could be raised a few inches along the centre, and the bricks be carefully laid in cement, with a sufficient fall for the rain-water to run off at once, and a proper escape made for it, the chapter-house would soon become dry, and yet remain for many generations, to delight its visitors, as it has on this occasion delighted the members of the Woolhope Club.

Time was getting on, and the way was now taken for the Bridge Inn. The Severn is here crossed by an iron bridge which is by no means picturesque, and looks more efficient than it seems to be thought, to judge by the notices on the buttress at either end.

The time for dinner had not yet arrived, so the ordinary business of the Club was transacted; three new members were unanimously elected; and the following subjects of interest brought forward.

THE HEREFORD ROMAN ALTAR, LOST AND FOUND.

The Roman altar which has been so much inquired for by archæologists of late years, in their visits to Hereford, and inquired for in vain, has at length been found. Mr. J. T. Owen Fowler made the happy discovery on the premises of the old Museum, on the Castle Green, where it has long been concealed by a luxuriant growth of ivy and other creeping plants. It has now been removed to the Free Library and Museum, and will take an honoured position on the landing of the staircase.

Mr. FOWLER gave the following description to the members of the Club, of this very interesting relic of antiquity.

This celebrated Roman altar is a monolith, and is still in good preservation. Its measurements are as follows:—

	Ft.	In.
Height	3	4½
Width at capital	1	5
Ditto at pedestal	1	5½
Ditto at centre	1	4
Depth at top and bottom	1	0
Ditto at centre...	0	10½

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The stone is chiselled at the top, in front, and at the sides, but is rough on the back, as if it had originally been prepared to stand against some other structure. A small piece has been broken off the right angle of the shaft, and it is worn and rounded somewhat by time and weather, but the capital and pedestal are still fairly perfect. There has been an inscription on the front surface, and the capital letters "D E O" are still to be made out, with some illegible traces of a further inscription, but the stone is very time-worn, and nothing more can be made of it.

This Roman altar was first found, in modern times, in 1821, when the foundations for the billiard-room were being dug near the Hereford Permanent Library in St. John Street. Mr. John Allen, jun., the excellent antiquarian to whom Hereford owes very much for the preservation of many of its most interesting antiquities, at once saw its value, and had it carefully placed on the Library premises. It was afterwards removed at the instigation of the late Dean Merewether, to the Literary and Philosophical Museum on the Castle Green. Its true character and very great interest were now fully recognised; its likeness was carefully drawn and engraved, and it became famous. Archæologists came to Hereford especially to see it, and it was an object of great admiration. Time, however, passed on, and the Roman altar shared the neglect and failure of the institution it belonged to. It became quite lost, and enquiries were made for it, in vain, at the meetings of the different Archæological Societies in the city. It has now again been found, and althongh it has not been improved by the further time, it is still in fair preservation, and will be more carefully preserved henceforward in the Museum at the Free Library. A rough sketch of the altar was handed round for inspection.

SOWERBY'S LEPTONIA.

A cluster of specimens of this very rare and interesting fungus, *Agaricus meleagris*, was then exhibited by Dr. Bull. It had been sent to him by Mr. C. B. Plowright, surgeon, of Lynn, and had the higher interest from being named after the great botanist, Sowerby.

It was then also announced that the second part of *The Herefordshire Pomona* was nearly ready, and copies of the prospectus were handed round to the members.

HEIGHTS OF HILLS.

The PRESIDENT then read to the meeting the figures recording the altitude of several mountains and hills more or less within the range of the Club, which had been recently procured for him from the Ordnance Office, by the Rev. Thomas Woodhouse. To this list we will add others in possession of the Club, marking by an asterisk those just procured:—

		Feet.
*Titterstone Clee,	Shropshire	1,755
*Brown Clee,	ditto	1,789
Stiper Stones,	ditto	1,650
*Stow Hill,	ditto	1,424
Wrekin,	ditto	1,320

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	Feet.
Cader Idris, Merionethshire	2,914
Snowdon, ditto	3,570
Arran Fowddy, ditto	2,955
Arenig, ditto	2,809
Plinlimmon, Cardiganshire	2,463
*Brecon Beacon, Breconshire	2,910
*Gader, ditto	2,660
*Mynydd Troed, ditto	2,000
Cradle Mountain, ditto	2,630
*Sugar Loaf, Monmouthshire	1,954
*Radnor Forest, Radnorshire	2,160
Cleeve Hill, Gloucestershire	1,134
May Hill, ditto	973
Malvern Hill, Worcestershire	1,394
Herefordshire Beacon	1,390
Longmynd	1,674
†Garway Hill	1,197

Mr. HENRY SOUTHALL was next called upon by the President to read a paper on

OUR ENGLISH WINTERS—WITH SPECIAL REFERENCE TO THE RECENT PROTRACTED PERIOD OF COLD WEATHER.

The unusual continuance of very severe weather is a matter of such recent experience and universal comment, that it may be interesting to ascertain how far a comparison with former years shows it to have been exceptional in its character, and to what extent there has been a departure from the average temperature of the season. Memory is but little to be trusted without accurate observation and notice. I well remember how in the bitter season of 1844—45, the remark was common that it was the most severe winter for 40 years, notwithstanding the occurrence of the celebrated "Murphy's" frost of 1838 (seven years before), and also how, two years later, in 1847, the same period of 40 years was alleged to have elapsed since a similar pinch. I think I can prove, however, that the "oldest inhabitant" would be right in saying that we must go back half a century, at least, to find a parallel to the late prolonged inclemency.

It is well known that the winter climate of these Islands is much milder than that of the same latitude on the continents of Europe, Asia, and America, and that this arises, not only from our insular position, but also from the prevalence of south-westerly winds, which, warmed by the high temperature of the Gulf Stream, over which they move, bring with them the heat and moisture of the tropics. When, however, as has been the case this year, northerly and easterly currents have taken their place, we experience a continental instead of an oceanic climate, and have snow and frost instead of rain and warmth. We know too

† Woolhope Transactions, 1869.

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that the comparative height of the barometer as indicating the pressure of the atmosphere over different adjacent districts regulates the force and direction of the wind, but we have yet to learn how "depressions," as they are technically called, are caused, and also what influences lead to their extension, movement, and dispersion or filling up. No doubt the solar heat is the great factor, but then comes the question how far the changes in the Polar ice, the descent of icebergs into more southern seas, and the acting and re-acting forces of electricity and magnetism have a secondary influence upon our climate. These are problems, as yet, sufficiently puzzling, and but to a small extent unravelled. The science of meteorology is, however, making rapid strides, and is calculated before long to confer great benefit on mankind. One thing is certain, whatever may be the primary reason of it, that the depressions which usually come to the north of the British Isles have, many of them, this season traversed France and the southern parts of England, causing an unusual downpour of rain in the former country, and heavy snowfall on the Alps—tremendous avalanches having recently overwhelmed several districts in Switzerland—and the awful floods in Hungary having arisen from the same cause. I propose then to consider in this paper what have been the special characteristics of the present season, as regards atmospheric phenomena, as well as the variation of climate which history and experience teach us our English climate undergoes.

We are dependent principally upon the old chronicles for information as to the endurance of frost and snow in the early times of our history. These notices, though sometimes scant and vague are, nevertheless, often sufficiently circumstantial to form a pretty reliable basis for comparison, and it would appear as if in former time the rigour and severity of our winter were considerably greater than at present, even allowing for the exaggeration which we often find in old writers. Thus in 250 A.D. the Thames was frozen for nine weeks; in 291, most of the rivers in England for six weeks; in 508, for two months; in 695, again the Thames was frozen over six weeks; in 908, English rivers for two months; in 923, the Thames for 13 weeks; in 998, for five weeks; in 1063, for 14 weeks; in 1433, for 11 weeks, as far as Gravesend. Now, if these statements are correct, and I have only extracted those which speak of definite effect produced, they indicate much colder winters than we now experience. The thermometer was not invented till 1590 by the celebrated Sautorius, some say by Drebel, a Dutchman, in 1620. It was improved by Reaumur in 1730, and by Fahrenheit in 1794; but our observations are not reliable till we get to 1771, and even then, up to 1814, there is some doubt of their strict accuracy. From that time to the present we have carefully prepared tables of the records at Greenwich, and also since 1826 at the Royal Horticultural Society's grounds at Chiswick. Taking, then, the period from 1771 to 1879, we find that, while there is not much difference in summer, the winter temperature, especially that of January, is some two or three degrees colder in the earlier than in the latter years of the series. Probably this is somewhat due to the increase of London, and the effect of so many fires and houses in warming the adjacent air, and therefore to some extent the comparison

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is less trustworthy than had a station been selected at a greater distance from town. In treating of our winters we have to consider their mean temperature, their duration, the periods of frosts, snow, and cold, the rainfall, winds, effects on vegetation, freezing of rivers, thickness of ice, &c. They sometimes set in as early as 20th October, as in 1859, and continue occasionally, as in 1799, 1814, 1837, 1838, 1853, and this year, 1879, till the middle or end of May. Sometimes we have a sharp spell early (with very severe frosts) in November. In these cases the proverb is generally true, "If it bears a man before Christmas it won't bear a goose after." In later times November was severe in 1782, 1786, 1851, 1858, 1871, and 1874. In each of these cases the following January was warm, and in most of them there was scarcely any frost after Christmas. Again, occasionally the frost sets in towards the end of November or beginning of December. In these cases it generally breaks up by Christmas, and often returns towards the end of January. Our most severe frosts, however, are those which commence the last week in December to the middle of January, and which have continued in a few cases for six or seven weeks almost unbroken; and then again, sometimes we have scarcely any winter till the beginning of February, and have then a long time of snowy, bitter weather, without any great permanence of frost, and when this continues to the end of May the epithet of "Black Spring" is not inappropriate. Occasionally we escape the whole winter, and scarcely have any frost at all. This was remarkably the case in 1778-9, 1795-6, 1821-2, 1827-8, 1833-4, 1845-6, 1847-8, 1868-9, when the mean temperatures of winter were respectively 45·9°, 44·5°, 46·2°, 45·8°, 45·9°, 45·7°, 45·3°, 45·1°.

The present winter may be said to have commenced on the 26th of October; from this time till the 4th December, without any severity of frost, we had with only two days exception (November 24th and 25th) continuously cold days and much north wind; the temperature generally many degrees below the average. From the 4th December the earth was frost bound till the 26th—the 9th to 15th and 20th to 26th inclusive being most severe. On the mornings of the 24th and 25th the thermometer registered 22 degrees of frost, with the mean temperature of 14 below freezing, or 20 degrees below the average of 60 years. On the 26th we had the curious phenomenon of a silver thaw, iron palisading and shrubs being coated with ice. On the 28th the strong south wind produced a remarkable change of temperature, and by the 29th the ice on the river Wye, which was frozen over on the 25th, and had borne well for skating on the sides, being from seven to nine inches thick in places, broke up and came rushing through the arches of the bridges with great force on the high flood. On the 31st the minimum reading of the thermometer was 40 degrees higher than on the 25th, and the mean of the 24 hours (51·4°) was higher than was reached again till May 20th. On the evening of New Year's day the frost again set in and continued for 12 days. On the 7th and 8th a heavy fall of snow to the depth of six to seven inches, when not drifted, ushered in five nights of intense frost, the clear sky and brisk dry wind causing the thermometer to descend on the surface of the snow to the following on successive nights, viz.:—4°, 9°·5, 2°·0, 0°. I have noticed lower tem-

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peratures before at four feet from the ground, but not such low grass readings for so many nights in succession. The following are the lowest I have observed:—
In 1838, Jan. 30, the mercury sank in the bulb and was below zero.

			deg.		deg.
1855, Feb. 18,	at 4 feet above ground	... ...	− 2	on grass	− 8
1860, Dec. 29,	ditto	... ...	− 2	ditto	− 10
1860, Dec. 29,	ditto	... ...	− 2	ditto	− 1'
1861, Jan. 7,	ditto	... ...	+ 5	ditto	+ 2
1870, Dec. 31,	ditto	... ...	+ 1·8	ditto	− 4
1871, Jan. 1,	ditto	... ...	+ 6·5	ditto	+ 3
1874, Dec. 31,	ditto	... ...	+ 5·0	ditto	+ 2'
1878, Dec. 24,	ditto	... ...	+ 9·8	ditto	+ 7·5
1878, Dec. 25,	ditto	... ...	+10·0	ditto	+ 6·0
1879, Jan. 12,	ditto	... ...	+ 7·0	ditto	− 2·0

To resume,—on the 14th January we had again a quick thaw, lasting only till next day. A temperature of upwards of 52° melted the snow except under the hedges. After cold rains and frosts from the east, we had a few days of bright weather with bitter winds till the 20th. We had now a spell of overcast weather; the sun was not seen for twelve days, with nearly the same temperature day and night, the first part frosty and fine, and afterwards snow, rain, and fog. More unpleasant weather could hardly be imagined. On the 5th February there was a decided thaw, rain falling almost every day till February 19th. On the 20th to 25th, another week of frosty weather with some snow. From 26th February to March 22nd, fine weather. The 1st, 2nd, 6th, 7th, 8th, 9th, 11th, 12th, and 13th being nearly cloudless days with sharp frosts at night. From the 21st to 28th overcast, bleak; constant east wind, specially bitter and strong, 20th to 25th; the last three days of the month being much warmer, and bearing out the adage that "March goes out like a lamb." With the exception of the 7th and 8th, April was cold throughout, and from April 10th to May 19th, or for 40 days, with the exception of two days slightly above the average, every day was below the mean, particularly 10th to 18th April, and 6th to 11th May.

On the whole, the only warm intervals during the seven months have been—six days at the close of December; two in the middle of January; seven in the early part of February; ten in the early part of March; three at the end of March; two at the beginning of April; two (5th and 21st) in May. There have been 103 days more than 5° below the average, and only 14 days more than 5° above it.

The duration of the wave of low temperature is longer than I can find any instance of since 1799; the average mean being lower than any since 1814, the year of the memorable twelve weeks' frost. Then, however, though the temperature was much lower from January to March than this year, the month of November was not so cold, and December and April were much warmer than this year. The average mean temperature for the 31 weeks, viz., from the 26th of October, 1878, to May 30th, 1879, has been at Greenwich 39·5, at Wolverhampton

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36·5, at Ross 39·1—the average being, as computed at the Royal Observatory, 43·2, thus showing a deficiency of 4° for the whole period. In round numbers—November was 3°, December and January 7°, March 1½°, and April and May 4°, below the average. There has been no day during the whole time in which the maximum has risen to 70°, which is unprecedented.

The rainfall has been near the average, except February, which, both as to amount and number of wet days, was much above the average. To summarize, we have had more severe frosts, much colder Februarys and Marchs than this year, a few colder Novembers, but December, January, April, and May, have been each of them nearly as cold as they have been known this century. Vegetation is more backward than since 1837. In 1845 it was more so at the end of March than this year, but April proved warmer. 1855, 1860, and 1861 were also backward seasons, but the present, if it does not quite equal the disastrous seasons of 1698, 1771, 1799, and 1816, which were in each case followed by wet and bad harvests (and in this respect we hope the comparison will not hold good), is one of the latest we have any account of.

Owing to the gradual approach of the frost, vegetation has not suffered to the same extent as in 1838 and 1860, the laurels and laurustinus having then been killed. Many tender plants have suffered notwithstanding. Our May and June flowers seem as if they would come together. Buckthorn was not out till April 29th. The hawthorn blossom (very early plants being out May 23rd, but not generally till June 1st) is about five weeks later than usual. It may be some encouragement to fruit growers to hear that after a similar April and May in 1837 we had splendid fruit crops, and if we get clear hot sunshine during the summer months of July and August there will yet be time for the ripening of the crops, which require, as is known, a certain quantity of heat to bring them to perfection.

P.S.—Since the above was written we have had three months of cold, wet, cloudy weather, with very little sunshine, temperature almost continuously below the average, and a very similar season to that of the summers of 1816 and 1860; but as this is beyond the range of my present paper, I will defer lengthened remarks to a future time. I trust I may have sufficiently proved that this is "annus mirabilis."

This paper had been most carefully prepared and was exceedingly interesting. It was accompanied with many very clever diagrams, which clearly demonstrated the extremes of heat and cold from the earliest times that records to be depended upon were kept. Mr. Southall received the cordial thanks of the Club.

Dinner was now announced, and the summons was gladly attended to with poetical appreciation:

"Unlike the flabby fish in London sold,
A Severn salmon's worth its weight in gold."

The host entertained the Club right well, and received a well-deserved compliment from the members ere they set off to the junction to take train to Much

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Wenlock. The sun now shone out brightly, and a few minutes pleasant ride brought the party to the pretty station of Wenlock, from which a beautiful view of the ruins is obtained.

THE PRIORY OF WENLOCK ANCIENTLY CALLED WIMNICAS,

Is very ancient, and has seen many changes. St. Milburga, the daughter of King Merwald, the founder of Leominster Priory, first erected a Nunnery here about the year 680, and presided over it herself as Abbess. This building was destroyed by the Danes, but was restored by Leofric, Earl of Chester, in the time of King Edward, the Confessor. It was then forsaken and became decayed, when Roger, Earl of Montgomery, Chichester, and Shrewsbury, a person of vast possessions, rebuilt and endowed it as a Monastery in the 14th year of William the Conqueror, placing therein a Prior and Convent of Cluniac Monks. The Priory became very rich, but suffered the fate of other alien Priories, during the wars between England and France, in spoliation. It however again became rich and remained so until it was suppressed by Henry VIII. The site was granted to Augustino de Augustinis, and two years afterwards was in the possession of Thos. Lawley, Esq., who lived in the Priory House. It has since continued to be private property, and is now in the possession of C. G. Milnes-Gaskell, Esq., who had most kindly given special permission to the members of the Woolhope Club to visit it on this occasion.

The ruins of the Church are very extensive, and its architecture singularly rich and elegant. Light and beautiful columns support pointed arches, very rich in detail. The Chapter House adjoins the church. Three circular Norman arches, enriched with undulated fillet work lead into it, and its sides are formed of curiously intersecting arches of peculiar interest. Further detail cannot here be given, except to state that the Priory precincts included 30 acres—that the whole length of the buildings from east to west was 401 feet; the nave of the church was 156 feet; the space under the middle tower 39 feet; the Ladye chapel 48 feet; and the width of nave and aisles 66 feet.

The ruins have suffered greatly from their immediate proximity to the town. During the last century whole portions of the masonry were pulled down, and the materials used to build houses.

The Abbot's house orignally formed a quadrangle. It is now occupied by Mr. Milnes-Gaskell, and the members enjoyed very much the kind permission which was given to visit the chief rooms. The oratory, with the altar and stone Norman reading desk, the ambulatories, the old oak fittings, &c., &c., excited great interest, kept up as the whole place is with the greatest care and the best possible taste.

There was no time to think of the celebrated ridge of Wenlock limestone, which forms so prominent a member of the Silurian system of rocks; the day was

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given up to archæology; and there was only time to visit the old Market House and Town Hall, and get back to the station for the train to Craven Arms. Here there was half-an-hour to get a cup of excellent coffee, price 2d., in a comfortable room at the Temperance Hotel—(why can't Hereford have its cheap and comfortable coffee house and reading room?)—when the train arrived for Hereford.

Thus another most pleasant and interesting day has been added to the annals of the Woolhope Club, and this account has been written in vain if it does not cause the faint-hearted to regret that they took no part in it.

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Woolhope Naturalists' Field Club.

JULY 29th, 1879.

THE third Field Meeting of this Club was held on Tuesday, 29th July, at Downton, on which occasion a goodly number of ladies, invited by special tickets, honoured the members with their presence. The train left Barr's Court at 9.25 a.m. for Ludlow, at which station carriages were waiting to convey the party to Downton. The conveyances were soon filled, and, the day being fine, the drive over the beautiful hill of Mary Knoll was most enjoyable. Immediately under this hill is the wooded valley of Hay Park, where the Earl of Bridgewater's children lost themselves and gave occasion to Milton to write "Comus."

The carriages were stopped at Aston for a short time to enable the members to inspect the little Norman church, when the Rev. G. H. Clay, the incumbent, explained its interesting architectural features. The Church was being restored: in the course of restoration, an old timber-jambed, square-headed, priests' doorway had been laid open in the north wall of the chancel; and a lychnoscope just opposite to it in the south wall. The north Norman doorway with its finely-carved tympanum (about A.D. 1120) was admired by the Club.

Since their visit, some original wall-painting of an early date has been discovered, and thoroughly well restored after the original pattern, by Mr. Robert Clarke, of Hereford, under the superintendence of Mr. F. R. Kempson, architect, of Hereford.

About one hundred yards east of this Church is a very conspicuous, though small, circular tumulus, with a moat surrounding it, half of which still remains full of water.

At the Hay Mill the party left the carriages, and wended their way through the beautiful and romantic scenery in the gorge of the river Teme to Downton, where many varieties of lovely ferns flourish in the greatest profusion.

On the bridge in front of the castle a halt was made to collect the visitors together. The private grounds and conservatories were then visited, and under a wide-spreading beech tree the President took the chair, and the business of the Club was transacted. The Rev. Henry Twells Mogridge was elected, and three other gentlemen were proposed as members of the Club.

The President next read an interesting paper written by Mr. Timothy Curley on "The monastic remains discovered in the construction of the Ludlow

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Cattle Markets," and a cordial vote of thanks was passed to Mr. Curley. Some time was then spent in walking about the beautiful grounds and the chief rooms in the castle, which were kindly thrown open to the members and their friends.

The return journey was made through Oakley Park (the seat of Lord Windsor) to Ludlow, where a meat tea was provided at the Feathers Hotel. The museum at Ludlow was visited by some of the members, who expressed themselves highly gratified by the excellent taste displayed in the arrangement of the valuable collection by Mr. Charles Fortey.

The following is a list of the members and their friends who attended the meeting:—Mr. A. Armitage (President), Mr. J. A. Bradney, Miss Bradney, Miss Jones, Mr. T. Davies Burlton, Rev. G. H. Clay, Mr. Devis, Mr. Charles Fortey, Mr. J. G. Fortey, Rev. E. J. Grasett, Mrs. E. Grasett, Miss Percival Smith, Mrs. Thompson, Mr. and Mrs. G. H. Hadfield, Mdlle. Suter, Rev. F. T. Havergal, Dr. T. S. Hawksford Hincks, Mrs. Hincks, Rev. E. J. Holloway, Miss Holloway, Miss Wenthe, Rev. A. W. and Mrs. Horton, Miss Bailey, Mrs. Norton, Miss M. E. Wood, Mr. R. M. Lingwood, Mr. J. Edward Lee, Rev. H. B. D. Marshall, Mr. C. G. Martin, Mr. T. C. Paris, Mr. W. A. Swinburne, Mrs. Swinburne, Miss Swinburne. Mr. H. Symonds, Rev. J. and Mrs. Tedman, Miss Plumer, Rev. S. Thackwell, Rev. D. C. Delfosse, Rev. H. W. Tweed, Miss Tweed, Mr. H. Vevers, Miss May Vevers, Mr. and Mrs. E. W. Colt Williams, Miss Timberlake, Mr. Theophilus Lane (Secretary).

MONASTIC REMAINS DISCOVERED AT LUDLOW IN 1861.

[By Mr. T. Curley, C.E., F.G.S.]

In excavating the soil for the Ludlow new cattle market in October, 1861, I discovered the foundations of an old monastery, which foundations I traced, and delineated on my published plan of Ludlow (see Archæologia, Vol. xxxix, 1863, article by Mr. Beriah Botfield, M.P., Ludlow, "Remains of the Priory of Austin Friars at Ludlow."

The stone used in the tracery, mouldings, door jambs, was a sandstone from the millstone grit series of the Clee Hill. The plinths, bases, and a portion of the large windows, with ball flower ornament, were of the Old Red Sandstone of the neighbourhood, very little of the Whitcliffe or Ludlow rock being used, except in the foundations.

The masonry above ground was in thin bedded flaggy Old Red Sandstone, the thickness of the courses being about three or four inches, and built with very bad mortar.

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The main walls generally were about 3 feet 3 inches thick, and the plaster remained on some of them. Deep drains were under the floors; these drains were half full of black soil.

The worked stone I placed on the top of the retaining wall in the cattle market, where I presume they are to be inspected.

Mr. Evans, architect, of Ludlow, from the remains found, restored the building, and I have no doubt he will lend the drawings for the inspection of the Woolhope Club. It was in the deep cuttings for the drainage pipes that the foundations were first discovered. The inhabitants of Ludlow had no tradition that there ever existed a monastery in that particular field.

The late Mr. Wright, in his history of Ludlow, referring to the "Monasticon," says:—"At Ludlow there was a house of Augustine friars without Goalford Gate, founded a short time before the year 1243, where it is first mentioned; in the 9th Edward II. (A.D. 1326) Robert Dobyn gave them two acres of land to enlarge their dwelling."

The late B. Botfield, Esq., having visited the site, headed a subscription for tracing out the foundations by means of excavations, which has enabled me to make a correct ground plan of the whole of the buildings, which covered about two acres.

The general plan was a block of buildings surrounding a quadrangle, the principal hall facing the south. The buildings on the east side project beyond the line of the hall, forming a wing, and terminating with deep angular buttresses; in this wing were found the oven, kitchen, cellarage with wine bottles, and a large group of rooms.

On the west side of the quadrangle, coloured yellow on the plan, were various long narrow rooms; there is a projecting wing on this side to correspond with the east side.

All the door jambs, plinth, and hook stones in this part were *in situ*, as well as fireplaces and a few window sills. The chapel forms the north side of the quadrangle, which must have been a very elegant building. On the south side of the building are the remains of two fish ponds, coloured blue on plan, and which were fed by a stream from a spring near the railway, which spring supplies the cattle troughs in the market with water.

The columns of the nave on the west side form on plan three segments of a circle to correspond with three sides of an octagon on the east side of the same.

The tower and steeple were on the east end of the chancel, for there the walls were six feet thick, and the mullions at that particular place have no grooves for glass, thus showing that the windows in the tower would be only louvered.

On the east side of the north transept two human skeletons were found; the handles being the only part of the coffins remaining.

I got also in the cutting a font, quern, keys, hinges, an abbot's ring, coins, counters, &c.

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The style of the building was Decorated. A great number of window heads were found, some having the ball flower. The window heads were equilateral, the door jambs were deeply recessed and moulded, and the spandrels beautifully ornamented. Most of the shafts of the columns were octagonal.

The buildings of this date were generally carried out by freemasons, who derived their science from the same central school. The result of this was that, at each successive period of the Masonic dynasty, every church or monastery erected resembled all those raised at the same period in every other place, however distant from it, as much as if both had been designed by the same artist.

This building, judging from details found, was very elegant. A large portion of it was paved with Norman tiles of every variety of design, some having inscriptions, and representations of birds, dragons, the Crucifixion, and circles and scrolls in endless variety.

Mr. Wright, in his history of Ludlow, says:—"Peter Undergod founded the hospital of St. John the Baptist near the bridge which led over the Teme to Ludford, and furnished it with friars of the Order of St. Augustine."

The site on which the church was built he bought of Walter Fitz Nicholas. Besides other revenues, he endowed it with the fulling mill, which appears to have stood near it, and which he had bought of Gilbert de Lacy, and with all his lands at Ludford. * * * *

The charters of Peter Undergod and Walter de Lacy have no date, but the royal confirmation is dated the 18th day of July, 5 Henry III. (1221), 658 years ago.

On the south side of the building were two fish ponds already alluded to; one has been filled up, and the other remains as perfect as the day it was excavated: it is perfectly rectangular, with slopes of about 1½ to 1 and about 4½ feet deep; and, taking the site altogether, it is one of the most beautiful that could be selected, the Teme being in the foreground, about 300 yards distant, and about 50 feet below the level of the site.

The site of this building stands 285 feet above the level of the sea, and 80 feet below the level of the Castle Green.

It is difficult to account for the scanty furniture that was in the monastery at the time of the dissolution, considering that they had the revenues derived from that splendid Ludford estate, in addition to the fulling mill. The Bishop of Dover obtained a commission from Cromwell in 1538 to visit the houses of the different orders of friars to receive their resignations. I extract the following from Mr. Wright's history of Ludlow:—

"From Shrewsbury the visitors proceeded to Ludlow (August 23rd, 1538), where they received the surrenders of the only two monastic houses there; these were convents of the Augustine and White Friars, the former situated near Old

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Street, adjoining to what is called Friars Lane. It would appear to have been in a reduced state, for the act of resignation is signed by a prior and only three friars." "Memorandum—We the Prior and Convent of the Austen Fryers, with one assent and consente, without any coaccyon or consell do gyve ower house into the hands of the lord Vysytor to the Kynges use, desyeryng hys grace to be goode and graycous to us. In wyttenes, we subscrybe ower namys with ower proper hande thys xxiiijth daye of August, the xxxth yere of the rayne of ower dred soveren lorde Kynge Henry VIIJth,—

Per me Egidium Pycuinge Augustinencium de Ludlow.
Per me fratrem Johannam Pratt.
Per me fratrem Willilmum Higges.
Per me fratrem Christoferum Hogeson.
By hus the bayllyffes of Ludlow.
William Yevans and Thomas Whelar."

The following inventory of the furniture is a proof that this house was not very rich :—

"The Austen Fryers of Ludlowe delyvered to Wyllyam Yevans and Thomas Whelar balys ther.

The Sextry.

Item—A chesabull and ij tenacles of golde with ij albes.
—A syngyll Vestement of blacke worstede.
—A syngyll Vestement of blewe damaske.
—ij olde copys.
—A cope of sylke with starres.
—A fayer cofer.
A chessbul and a tenacle of olde blacke velvet.

The quere.

Item—ij olde auter clothes.
—A holy water stope, laten.
—A deske of tymber.
—vj auter clothes steyneyd, olde.
The quere new stalleyd.
ij fayer belles and lytyll bell in the steepull."

"The halle, buttere, and keychn—
Item—A lytyll tabull and ij trustelles, a forme, and ij olde cupbordes.
—A pan and a kettell.
—A lytyll brass pott.
—iij pewter plateres, olde.
—A lytyll broche.
—A fayer gret cupborde.
—A gret trowe.
—A tabull and ij formys.
—Fayre lavares of tynne.
Memorandum,—A boxeful of evydens.

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And ther rest in the vysytores handdes a chales weyeynge xiij unc. Also ther laye to plege beynge copper within, all weyeynge bothe the copper and sylver vj^{xx}ix unc., for whyche the vysytor payde for the said fryers vj^{li} xiij^{s} j^{d}

WILLIAM YEVANS
THOMAS WHELAR } Balys.

There be renttes yearly iiij^{li} above the owte renttes."

There are several trifling things in the above schedules, and it would appear that there were no beds, knives, forks, or spoons. These omissions may form grounds for a discussion by the archæologists present.

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Woolhope Naturalists' Field Club.

AUGUST 29TH, 1879.

THE fourth field meeting of this Club was held on Friday, 29th August, on the Radnorshire Hills, near Hay. The members from Hereford left the Barton station by the first train for Hay. On arriving there soon after ten o'clock, they were joined by the President (who was staying in the neighbourhood), and the local members. Carriages were in waiting at the station, and a start was immediately made for the proposed route. Mr. E. H. Cheese, of Hay, kindly undertook to pioneer the party, and from his local knowledge was enabled to afford much information to the Club. After crossing the Wye by the fine iron bridge at Hay, and passing the picturesque village of Clyro, the party arrived at Court Evan Gwyn, where the remains of an old border fortalice were examined. Thence ascending the steep sides of Clyro Hill, at the highest point of the road, a magnificent view was obtained of the surrounding country for many miles. The plain of Herefordshire, bounded by the Malvern and Clee Hills on the one side, and the valley of the Wye lying beneath, with its grand background of the Black Mountains, and the Brecon Beacons on the other hand, formed a panorama that will not readily be forgotten, and was thoroughly appreciated by the party, one of whom exclaimed, "Call this Italy, and the whole world would come to see it!" It is indeed a magnificent prospect that may be seen from those roads and pathways over Clyro Hill, stretching as it does from the Shropshire Clees to the Carmarthenshire Vans. After a halt to enjoy this view, the descent was made into the valley where the well-known bog of Rhos Goch lies. After visiting the site of another stronghold of bygone days the party separated—some going to explore the bog, and the others up a steep hill to Bryngwyn Church. Here at this quaint old Welsh Church the party were received by the Incumbent, the Rev. Mr. Hughes, who courteously showed what there was of interest. The Church has been recently and very handsomely restored, chiefly owing to the exertions of Mr. Hughes. There is an interesting old cross in the churchyard, and what appears to be the cover of a stone coffin or tomb let into the wall of the porch. A very old yew is standing near the cross. A valuable gold coin, supposed to be a Burgundian noble, of the 14th century, was found in the earth of the floor of this Church when it was being repaired, and extracts from Mr. Banks's pamphlet about it were read by Canon Bevan and Mr. Cheese. This coin belongs to Mr. R. W. Banks, who had kindly sent it for exhibition. It is in fine preservation,

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and was an object of great interest to the meeting. How it came beneath the floor of the Church is a mystery upon which a lively imagination may exercise itself at liberty. From thence the route lay along the valley to Painscastle. A halt of a couple of hours was made here, and the site of the old Castle was visited. Mr. Cheese had promised to read a paper here descriptive of Painscastle and its surroundings, but the strong wind that then blew over that exposed situation, and the late arrival of the botanists from Rhos Goch, made it more desirable to defer its reading till after dinner at Hay. Happily none of the division visiting the morass were lost in its treacherous pitfalls; and after obtaining several very interesting botanical specimens—*Triglochin palustre*, *Utricula vulgaris*, *Lastrea Thelypteris*, and as much as might be wanted of the Royal Fern, *Osmunda regalis*—they were hospitably entertained by Mr. Griffiths, of Portway, whose family has resided there for upwards of 500 years. At three o'clock the signal for the return route was given, and the party re-united; they started for Hay, where, after a delightful drive over the Begwyn hills, they arrived by four o'clock, quite ready for the plain but substantial and comfortable dinner provided for them at the Crown Hotel. After the ordinary business of the Club had been transacted, the President called on Mr. Cheese to read his paper on Painscastle. This very able and interesting paper proves that the Woolhope Club has amongst its members gentlemen who are well able to illustrate the history of the district when they will take the trouble to do so, as Mr. Cheese has done. An interesting and useful botanical paper was read by Dr. Holmes, of Leominster, on "The Uses of some Wild Plants," and then, train time being up, a speedy adjournment to the station ensued, and so came to an end one of the most agreeable field-days of the year. The members who took part in the day's proceedings were—The President (Mr. A. Armitage), Mr. G. H. Piper (President of the Malvern Field Club), Messrs. Morris, and W. A. Swinburne (Vice-Presidents), Rev. Canon Bevan (hon. member), and the following members and their friends:—Mr. E. H. Cheese, Mr. C. Devis, Mr. Hall, Dr. Hincks, Dr. Holmes, Rev. Mr. Hughes, Mr. F. R. Kempson, Mr. Kempson, jun., Mr. C. J. Lilwall, Mr. J. W. Lloyd, Rev. H. B. D. Marshall, Rev. H. T. Mogridge, Mr. H. C. Moore, Mr. T. C. Paris, Rev. W. Jones Thomas, Mr. A. Purchas, Mr. Samson, Mr. O. Shellard, Rev. W. R. Shepherd, Rev. W. H. Tweed, Mr. H. Vevers, Mr. Watkins, Mr. Theo. Lane (Secretary).

PAINSCASTLE-IN-ELFAEL, RADNORSHIRE.

[By Mr. EDMUND H. CHEESE.—29th AUGUST, 1879.]

IF the district selected by the Woolhope Club for their excursion to-day presents no striking feature of attraction to the antiquarian, it indisputably possesses charms in its lovely varied scenery, which cannot fail to be appreciated.

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But while the eye lingers upon the display of natural beauty spread out so profusely before it, the memory will be carried back to scenes of the dim past,—to that period in every nation's history when the fire and sword of the invader, with the invariable accompaniment of civil feud and bloodshed, seem by an inscrutable law, the necessary precursors of religion and civilization.

On this border-land, where the ancient Briton so obstinately contested every inch of his native territory with successful invaders, and where the good old rule of bird and beast

> That those should take who have the power,
> And those should keep who can

obtained in a great measure amongst men, traces are not wanting of the extent and severity of these oft-recurring contests.

But our interest to-day will centre in the once formidable stronghold where we are now assembled. To write the history of Painscastle seems very much like writing the history of one stone in a building, though that stone has little or no importance apart from the building itself. The castle, like all others, has no doubt a history of its own, if one only knew it, which would be interesting enough. One would like to know, when one looks now on its mouldering remnants, what sort of a place it was in its glory; who and what manner of men they were to whom it was a home; how they lived when they were not fighting; how they employed and amused themselves; for, in spite of the troubled character of the times, they could not always have been in "battle order." But, as we cannot

> Draw oblivion's pall aside
> And mark the long-forgotten urn,

and as we know nothing whatever of the internal or domestic life of Painscastle, we must view it in connection with the history of the times in which it sprang into existence, and in this respect, though the actual facts we know of it are few, it is interesting.

Placed on the border line between two races, it forms one of a series of fortresses which tell of the progress of perhaps the most important and interesting conquest the world has ever witnessed—the subjugation of these Islands to the rule of that race in whose hands they have become the ruling power of the universe.

We cannot, of course, help admiring the courage and resolution with which the Welsh people resisted for two centuries the advance of the Norman conquest, although it is a mistake to suppose that patriotism of the purest kind was always the animating motive of their chiefs, but it is not to be denied that the result of that conquest was to the Briton, as it had been to the Saxon, an almost unmixed blessing.

Anyone who has read the details of early Welsh history must admit this, and there is one comforting reflection on viewing the mouldering ruins, or the grass-grown site of one of these ancient border castles, that though we now look back to them as relics of a barbarous age, they really mark an important stage in the civilization of the world, however far that stage has now been left behind.

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The Norman conquest of Wales, though not completed till the reign of Edward I., was really begun by William I. That far-seeing Sovereign had doubtless planned, and had he not been interrupted by difficulties amongst his own subjects, would have accomplished the subjection of the whole of South, and perhaps of North, Britain. Frustrated in this design, he yet set on foot the movement westwards, carried out by his successors.

Placing his lieutenants at Chester and Hereford, which thus became the basis of all future operations, he gave full power to these and others to wrest what they could from the Welsh—a permission they did not fail to make the most of—securing their conquests by castles as fast as they made them.

Of the 49 castles mentioned in Domesday Book, one-sixth are mentioned as belonging to the Herefordshire border, and these, including Wigmore, Monmouth, Caerleon, &c., may be said to form the first line of Norman operations.

William Rufus and Henry I. carried on the work with vigour.

The latter it was who conceived the politic idea of settling Flemings in Pembrokeshire (Rhos), who, under the peaceful title of colonists, should be really a garrison attached to his interests. The presence of these was, of course, an irritation to the Welsh, who, under Griffith or Gryffyn-ap-Rhys, rose in arms, took Cardigan, and cut off the Flemings, and affairs became so serious that Henry found it necessary to go into Wales in person. His son, Robert of Gloucester, suppressed the insurrection—South Wales submitted, and Gryffyn's possessions were reduced to the single Comat of Cayo, in Carmarthenshire. To secure this conquest, fresh castles were built, and amongst them, there is reason to believe, the subject of this paper—Painscastle—so called from its founder, a follower of the Conqueror, Payne Fitz John, or "Paganus de Cadwrcis," Lord of Ewyas, Sheriff of Hereford and Shrewsbury, and one of the King's secretaries. He was the companion in arms of Bernard Newmarch, Lord of Brecknock, and these two generals, attacking Cadwgan, the prince or regulus of the territory, then weakened by successive hostilities, and by the defection of the Earl of Powys, possessed themselves of the district around Glasbury and Llanbedr. The Castle was erected upon the site of a British camp or military station, called "Caer-yn-Elfael," and probably formed one in a second line of fortifications with Hay, Bredwardine, Huntingdon, Radnor, Clun, and perhaps others.

Payne died about the year 1136 or 1137. He was a man of distinguished activity and valour, trusted alike by friend and foe, for in the "Annales Cambriæ" we are told that to his keeping was delivered Llewellyn Ap Owain, when taken prisoner by his brother Meredyth, Anno 1128—a fine instance of Welsh family feud. The Castle was completed by his son. It was of considerable strength and importance. Viewed from the ruins, the situation appears to be almost the centre of a circle formed by the surrounding hills of Llanbedr, Beggwyns (or beacons), and Clyro, but it really stands upon a spur of the first-named hill, and in a position at once commanding and picturesque. It had a lofty keep or citadel, surrounded by a moat 20 feet deep, and an outer moat encompassing an area of an

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acre and a half. It was also secured by an exterior entrenchment of considerable depth and extent, chiefly the remnant of the British fortification before mentioned, and now almost entirely obliterated. It has been a matter of conjecture how these trenches and moat were supplied with water, as it will be seen they apparently stand above the level of the lands around. A large quantity of water may, however, have been collected from the range of hills to the north, and the tradition is that the water was supplied by pipes communicating with the three springs now known as "Ireland Well," and which gave rise to the little river "Bachhowey" (Little Wye), which runs through the valley. Painscastle was situate within the boundary called "Fferllys," and in the lordship of Elfael, distinguished to this day as Upper and Lower Elfael. Elfael subsequently formed two distinct hundreds, namely, Painscastle and Colwyn—so named after the two castles, for at the latter place, about six miles distant from Painscastle, stood "Colwyn," or "Maud's" Castle, built in the reign of King John, by "William de Braos" (to whom this district and the Castle of Payne had passed), in honour, as it is said, of his wife, the redoubtable "Maud de Haia," or "Moll Walbee," who, tradition says, restored Hay Castle in a single night, carrying the stones in her apron; and who threw the little pebble (of some feet in diameter), that had got into her shoe, and after a time caused her some trifling annoyance, into the neighbouring churchyard of Llowes, where it still remains, incontestible evidence of the truth of the legend.

In the reign of Richard I., we are told in the "Brut-y-Tywysogion" (or "Chronicles of the Princes"), that Roger Mortimer came with an army into "Maelynydd" (Radnorshire), and having expelled the sons of Cadwollon, built the castle of "Cwmaron." In the following year, however, Prince Rhys collected an army and burned it. From thence he marched to Colwyn, compelled it to surrender, and burned it. From thence "he speedily marched with his army to Maes-Hy-fedd (New Radnor), which he burned, and, after burning it, on the same day Roger Mortimer and Hugh de Lacy marshalled their armed forces of cavalry, equipped with helmets and shields, unawares, against the Welsh in an adjoining field, and when the 'magnanimous' Rhys observed this, he accoutred himself like a lion of a furious heart with a mighty hand, and attacked his enemies and turned them to flight, and pursued them, and dealt with them as of no account, though in a manly way, so that the Marchers regretted extremely the excessive slaughter of their men. And then he immediately attacked Pain's Castle in Elvael with missiles and engines, and compelled it to surrender. After obtaining it there was an agreement between him and De Braos, in consequence of which he relinquished that castle in peace."—"Brut-y-Tywysogion."

Tradition, however, appends a much more romantic story to this latter event. A beautiful girl (daughter of one of the descendants of the old native reguli), residing at Ys-cryrn (now Skreen), in the neighbouring parish of Llandilo-Graban, was disporting herself with her female attendants on the lake at Bwchllyn, some two miles from Painscastle. They were observed by de Braos and his followers returning from hunting. Enamoured of her beauty, he caused the

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whole party to be forcibly taken to the Castle, where they were detained. Her relatives sought her in vain, though suspicion turned to the Norman lord, and the Castle was watched. After a short time the lady contrived to place at night a locket, or token of her house, over a lighted candle in an upper window of the Castle. This was at last observed by her friends, and the suspicion of her incarceration confirmed. Petition was at once made to Prince Rhys, then beseiging Radnor (as just mentioned), to come and rescue his fair relative and dependent. He promised compliance as soon as he had demolished Radnor, and, this done, he at once marched on Painscastle. The de Braos feigned ignorance of his mission, but at night, the signal being repeated, Prince Rhys annouced his determination to atttack the Castle if the lady was not at once restored. His request was unnoticed, and a strong contingent coming to the assistance of the garrison from a dependency of the Castle, Court Evan Gwynne, de Braos marched out and gave battle to his assailants in the plain below. A sanguinary engagement ensued, and the waters of Bachowey were turned red with blood. The crimson stream floated far down the Wye, keeping its separate course and colour unmingled with the waters of that river, and conveying the tidings of the battle to the awestricken inhabitants around. Victory, however, rewarded the gallantry of Prince Rhys. The fair prisoner was discovered and released, and the Castle much despoiled. Having attained his object he withdrew. He died in the following year. He has been described as an Achilles in strength, a Nestor in kindness, a Hector in prudence, a Hercules in gallantry, a Paris in beauty, an Ulysses in speech, a Solomon in wisdom, an Ajax in mind,and the foundation of all excellencies.

Two years later (1198) Traherne Vychan, Lord of Llangorse, was invited by de Braos to a friendly conference near Brecon. Vychan accepted the invitation and was met by de Braos outside the town, seized by his bloodhounds, tied to his horse's tail, dragged through the streets, and ultimately beheaded. Gwenwynyn, Prince of Powys, connected by marriage with Vychan, determined to avenge this outrage. With a strong force he entered Elfael and laid siege to Painscastle, vowing he would reduce to ashes the whole country from thence to the Severn. He delayed operations so long, however, that the besieged found time to solicit aid from England. This was granted, and assisted by the Lords Marchers and by Griffith, son of Prince Rhys (who was released from prison for the purpose, and was an enemy of Gwenwynyn's,) a large gathering, under Geoffry Fitzpeter, Earl of Essex and Chief Justiciary of England, marched to the assistance of the garrison. A bloody engagement ensued and the Prince of Powys was defeated. It is said that 3,700 Welshmen fell in the battle.

William de Braos was afterwards banished the country by King John, and his wife Maud and her son were afterwards starved to death in a dungeon at Windsor. The honours and lordships he possessed were escheated to the Crown. They were restored to his brother Giles, Bishop of Hereford, and the daughter of a subsequent de Braos, Maud, marrying Roger de Mortimer, the Cantref of Elfael, with the Castle of Payne, passed to the House of Wigmore, where it remained until it devolved by marriage upon the House of York, and afterwards to the

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Crown. Whilst, however, the possessions of William de Braos were in the hands of his brother Giles, Bishop of Hereford, as an act of retribution for the wrongs done his ancestor, he caused Walter Vychan (now Vaughan) son of the original proprietor, to be reinstated in a portion of the estate of Lower Elfael and the Castle of Payne, subject of course to his superior lordship. This portion, including Glasbury and the present estate of Maesllwch, remained in the family of Vaughan until a recent period. Upon the male line becoming extinct the property passed by marriage to Humphrey Howarth, of Calbalfa. From his son, Sir Humprey Howarth, it passed to the family of Wilkins, now de Winton, with whom it still remains.

In the reign of Henry III. I find an important notice of Painscastle. There was as usual an insurrection of the Welsh, and one Prince Llewellyn (it is impossible to distinguish between them) burned the towns of Baldwin Maes-Hyfedd (Radnor) and Aberbodni, and razed their castles to the ground; another account says Brecon, Hay, and Montgomery. It is probable also that he destroyed Painscastle (though it does not say so) for we read that Henry, to prevent a repetition of this incursion, came into Wales, and (in 1231) "built the Castle of Paen of stone and mortar most nobly, and garrisoned it amply with a number of armed men."

From this it would appear either that Painscastle had been destroyed as we have said, or that it had been previously a fortress of a ruder and inferior kind; or it might be that Henry added the "keep" to the earthen fortifications existing before.

The successor of Henry, the renowned Edward I., as is well known, completed the conquest of Wales. He, we are told, sent three armies into Wales, one commanded by himself, the second by Roger Mortimer, and the third by Paine (son of Patrick de Says); and Roger Mortimer had command of the King to admit him into all his castles and garrisons. This Paine was doubtless a descendent of the founder of the Castle. He was called the Conqueror of South Wales, for at this time his success was so great that the Welsh sought peace, and being thus victorious he became Governor of the Castles of Dumeron-Karekeny and Llandevery. He died 1279, leaving a brother (Patrick) who died (1283) leaving issue Maud, married to Henry of Lancaster, the King's nephew. His mother married Hugh le Déspenser.

The surname of Cadurci or Cadwrcis, borne by the Fitzpaines, appears to have become corrupted or varied to "Chaworth," and from another branch of the family sprung the Chaworths of Notts—Lord Byron's Chaworths.

That the family was one of the most distinguished of those Norman lords who came over with the Conqueror is certain, as the name appears on the Roll of Battle Abbey.

In the year 1403, at the time of Owen Glendwr's rebellion, King Henry IV., to secure the Welsh castles, committed those of Payne's Castle and Royl (Clyro) to the custody of the Earl of Warwick.

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The town or village was originally built by William de Braos. Subsequently we find a borough court was held there, and three annual fairs for the sale of horses, cattle, and sheep.

The borough of Painscastle being within the Cantref of Moelynaidd, should have, apparently, shared in the right conferred on the other boroughs within that Lordship, of electing a member to serve in Parliament. But it appears to have lost, or never to have acquired that right, for in the year 1690, upon a contest for the boroughs taking place between Sir Rowland Gwynne and Mr. Robert Harley, the burgesses presented a petition to the House, claiming the right of voting. The claim, however, was disallowed, and has never since been renewed.

I have now brought down, however imperfectly, the history of Painscastle to the time of the complete subjugation of the Welsh. At that time I think it may be fairly assumed, with its lord high in the confidence of the King, to have reached the climax of its dignity.

Of its subsequent history and dismantling, little apparently is known.

Relieved of the constant fear of molestation and destruction, no doubt the sword was soon turned into the ploughshare. The Castle, ceasing to be necessary for refuge and defence, became too retired for a residence, and gradually crumbled to decay.

The inhabitants around having learned after a hard lesson the blessings of good Government, turned their attention to the cultivation of the soil, and soon developed the peaceful happy valley which we now see around us.

Respecting Payne Fitzjohn, the founder of the Castle, I am reminded by a friend, to whom I am indebted for much of the materials for this paper, Mr. John Hutchinson, Librarian of the Middle Temple, that there is a remarkable legend told by Giraldus Cambrensis, in which Payne Fitzjohn is made to figure as an important character.

Giraldus makes the scene of the story the lake of Llangorse, but Mr. Hutchinson thinks it might be appropriately transferred to the gloomy bog or morass of "Rhosgoch," without a reference to which no notice of Painscastle would be complete, forming as it does one of the most marked natural features of the neighbourhood.

Mr. Hutchinson, acting on this idea of transferring the scene, has sent me a version of the legend in verse, which I will venture to read, and which I think will form a not inappropriate conclusion to this paper. It runs thus—

RHOSGOCH.

In Norman times *(a)* take it from me
Upon the best authority,
For, somewhat differently worded,
In Gerald's *(b)* page it stands recorded,

(*a*) A.D. 1136. (*b*) Giraldus Cambrensis; It. Gt. Bt., No. 21, vi.

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In Norman times, when he was king,
Whose praise for learning churchmen sing, *(c)*
There lived upon the British border,
By arms of late reduced to order,
A prince of ancient power and fame,
Of royal blood, Gryffyn by name;
Gryffyn ap Rhys, ap Tudor, ap—
No more I know, nor care a rap—
Suffice he traced his own descent,
Far back to the Old Testament,
And was by right divine, no doubt,
More king than Henry, out and out.

Time was all Brechin *(d)* owned his sway,
From Mynydd Epynt down to Hay;
But late, alas! the Norman lance
Had pierced his broad inheritance,
And his fair cantrefs *(e)* all save one,
To Milo *(f)* or De Bruce *(g)* had gone,
And e'en for that he had to bring
A tribute to the English king.
And so it happed, that on a day,
Returning from the curia, *(h)*
Where for that purpose he had been,
He rode with Milo and Fitz Paine,
Deputed by their liege the king
Him safe towards his home to bring;
His home by *(i)* Dolaucothe's glen,
Beneath the slopes of dark Maelen.

Across the hills their journey lay
Whose summits look o'er castled Hay;
And soon they came where, place of fear!
Extends Rhosgoch's wild mountain Mere—
Rhosgoch, *(j)* whose quaking treacherous sod
No foot of traveller ever trod—
And there awhile our cavalcade
A halt to view the prospect made.

Before them, bottomless and vast,
Stretched out the dim mysterious waste,
As neat a bog as you might see
In Erne *(k)* round Limerick or Tralee,
Without the cabins and the hogs
That give some life to Irish bogs.

(*c*) Henry I. (Beuclerc). (*d*) Brechiniog. (*e*) Welsh divisions of a Principality. (*f*) Ear of Hereford. (*g*) Lord of Abergavenny. (*h*) Royal court. (*i*) Carmarthenshire. (*j*) Giraldus tells the story of Llangorse. (*k*) Ireland "Ierne."

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Within its solitary bound
No sign of human life is found;
Its waters, black by day, 'tis said
At night, beneath the moon, gleam red,
And so of old its name *(l)* it got.
But whether this be so or not,
No tongue of mortal can express
Its weird and gloomy ghostliness,
Which makes no traveller pass that way
If he can help it, night or day.
Such feeling o'er our travellers three,
Though they were brave, as brave could be,
A moment stole; but soon Fitz Paine
And Milo were themselves again;
And thus the latter, with a laugh,
Began his British friend to chaff.

"This, sure, must be the place," quoth he,
"I've heard about from infancy,
(I know among these hills it lies)
O'er which the wild fowl silent flies,
Nor utters once a cry or song
From year to year its reeds among,
Save when some prince of native right
Commands! then up, in sudden flight,
From every soak and pool they rise,
And fill the air with clamorous cries;
And now, Ap Rhys, it seems to me
No fitter time could ever be
To prove this story, false or true.
I'd like to test it; what say you?"

Quoth Gryffyn "I consent; but since
Of this domain you now are prince
Suppose you first your title try."
Quoth Milo, "Willingly will I;"
Then, turning towards the marsh, he gave
A shout that might have pierced a grave.
But when its echoes died away
The marsh, as erst, in silence lay.
Again he tried, and tried Fitz Paine,
In French and Welsh, but all in vain;
At their command no feather stirred,
Nor voice along the Mere was heard.

(*l*) Rhosgoch—Red Marsh.

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When they had ceased, they turned to Gryffyn,
His virtue with as small belief in;
Who, straightway from his horse descending,
And t'wards the East in reverence bending,
Implored the Saints his prayers to aid;
Then, turning to the lake, he said:—
"Ye wild-duck, widgeon, teal, and coot,
I charge ye, be no longer mute!
That I am *(m)* Deheubarth's lawful prince,
These Normans, once for all, convince!"

He spoke, and, sudden as a flight
Of darts, the air was black as night
With countless wings, that wheeled around;
While, far and near, the hills resound;
And such a chorus rends the air,
No mortal ear for long might bear.

Fear seized the bosom of Fitz Paine;
He'd heard about the Stygian plain,
And, for a moment, thought he stood
Transported to th' infernal flood,
Where all the air is densely crammed
With floating spirits of the damned *(n)*;
And even the sterner heart of Milo
Thought of the monstrous forms *ex Nilo*,
Portrayed upon the wondrous pages
Of Christian Saints and Pagan Sages.
So, leaving Gryffyn to pursue
His way alone, these warriors two
Back to the King returned, pell mell,
With tidings of the miracle.
Whereat the King, who was a clerk *(o)*,
Uttered, 'tis said, this shrewd remark,
Prefixing to 't (although I'm loath
To mention it) a good round oath:—
"Friends Milo and Fitzpaine," quoth he,
"At this strange tale you bring to me
Be not surprised; for though 'tis true
These birds refused to notice *you*,
When I am Cambria's lawful King,
For *me* they'll doubtless learn to sing."

(*m*) South Wales. (*n*) Vide Dante &c. (*o*) Beauclerc scholar.

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Woolhope Naturalists' Field Club.

THE FUNGUS FORAY, 1879.

THE Forays occurred as usual this year. The following leading English mycologists being present:—The Rev. M. J. Berkeley, Messrs. Broome, Cooke, Lees, Plowright, Phillips, Cecil Sp. Perceval, Renny, G. Worthington Smith, Vize, &c.—with M. Maxime Cornu, Quélet, and Emile Boudier from France.

For the Club day, Thursday, October 2nd, the foray was fixed for the woods at Foxley. Dinner was held as usual at the Green Dragon, after which a paper was read by M. C. Cooke, M.A., L.L.D., entitled: "Croutes aux Champignons."

After dinner, a soirée was held at the house of Mr. Cam; and during the course of the week papers were read as follows:—"On the Influence of Situation, Soil, and Season on the Growth of the Larger Fungi," by Cecil H. Spencer Perceval, Esq. "The Fungi of our Dwelling Houses," by William Phillips, Esq. "On the importance that should be attached to the dehiscence of Asci in the Classification of the Discomycetes," by William Phillips, Esq. "A New Genus of Discomycetes," by Dr. Cooke. "Quelque nouvelles espéces de champignons trouvées en 1879 (Jura et Vosges)," by M. le Dr. L. Quélet.

THE INFLUENCE OF SEASON, SOIL, AND SITUATION ON THE GROWTH OF THE LARGER FUNGI.

[By CECIL H. SP. PERCEVAL—Read October, 1879.]

I purpose in this paper, to state a few observations I have made, with regard to some of the larger fungi; *first*, as to the season at which they occur; *secondly*, as to the soil they appear to prefer; and *thirdly*, as to the situation in which they are usually found.

That it may not be assumed that these observations are the result of study over a limited area, I will mention that they were made principally in the following Counties,—Somersetshire, Devonshire, Gloucestershire, Herefordshire, Sussex, Surrey, Warwickshire, Lincolnshire, Yorkshire, and Northumberland.

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Autumn, as our gathering here year by year shows, is the season, of course, in which the majority of the larger fungi appear. The soil, warmed by the summer sun, quickens, and brings to maturity the mycelium, which has been growing, and developing under its influence, in the more shady, and damper situations of our woods and fields. A hot and sunny autumn, with occasional warm thunder showers, succeeding to a warm summer, is the most favourable season to their growth; as the ground becomes thoroughly warmed by the sun, so that the rain, when it falls, nourishes the mycelium, and evaporating quickly has not time to chill the ground, and so check the tender rootlets.

After a cold and wet summer, the mycelium growth is retarded, and it cannot properly develope, or mature, so that many species are absent, and many specimens found are ill-grown, and stunted, from want of sufficient warmth.

Several, however, of the Hymenomycetes, and other families, I have noticed only in winter, and early spring, so that this explanation cannot apply to them. The following are those, most of which, I have more than once found at these periods of the year:—Ag. *(Tricholoma)* gambosus (April and May), Ag. *(Pleurotus)* subpalmatus (Jan.), ostreatus (Mar., Nov., and Dec.), atro cœruleus (Jan), Ag. *(Collybia)* velutipes (Dec. and Jan.), tenacellus (Jan. and Mar.), Ag. *(Mycena)* polygrammus (Jan.), alcalinus (Jan.), galopus (Dec.), Ag. *(Claudopus)* euosmus (Jan.), Ag. *(Pholiota)* præcox (Feb.) Ag. *(Flammula)* flavidus (Jan.), hybridus (Dec.), sapineus (Jan.), Ag. *(Crepidotus)* mollis (Dec.), Ag. *(Naucoria)* semiorbicularis (Jan.), Ag. *(Galera)* tener (May), Ag. *(Tubaria)* furfuraceus (Feb.), Ag. *(Stropharia)* æruginosus (Dec.), Ag. *(Hypholoma)* fascicularis (May), Ag. *(Psathyrella)* gracilis (Apr.), disseminatus (Jan.), *Coprinus* comatus (Feb.), micaceus (Feb.), deliquescens (Feb.), *Lepista* nuda (Dec.), *Hygrophorus* hypothejus (Dec.), russo-coriaceus (Dec.), *Cantharellus* aurantiacus (Dec.), muscigenus (Dec.), *Marasmius* ramealis (Dec.), *Panus* conchatus (Jan.), stypticus (Jan.), *Trogia* crispa (Dec.), *Lenzites* betulina (Feb.), flaccida (Mar.), *Polyporus* brumalis (Dec. and Jan.), leptocephalus (Dec. and Feb.), fumosus (Feb.), adustus (Dec., Feb., and Apr.), crispus (Feb.), amorphus (Dec. and Jan.), fomentarius (Dec.), conchatus (Jan.), ulmarius (Mar.), fraxineus (Mar.), annosus (Jan. and Mar.), versicolor (Feb.), abietinus (Feb.), ferruginosus (Dec.), vitreus (Mar.), *Trametes* pini (Dec.), suaveolens (Mar. and Apr.), *Dœdalea* quercina (Apr.), confragosa (Feb.), unicolor (Dec.), *Merulius* tremellosus (Dec.), corium (Dec., Feb., and Apr.), *Radulum* quercinum (Jan.), *Phlebia* contorta (Jan.), *Grandinia* granulosa (Jan.), *Thelephora* arida (Dec. to Mar.)

The Genus *Stereum* seems to prefer that time of year, as I have found purpureum in Jan., spadiceum in Dec. and Feb., sanguinolentum in Jan. and Apr., rugosum in Dec. and Apr., *Hymenochæte* tabacina I have found in Jan., Auricularia mesenterica in Feb. The Genus *Corticium* is also plentiful at that time of year, as the following species, which I have found, will show,—*Corticium* evolvens (Mar.), giganteum (Dec.), lacteum (Mar.), læve (Jan.), cœruleum (Jan.), cinereum (Jan.), incarnatum (Mar.), nudum (Apr.); also *Cyphella* Curreyi (Mar.)

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and capula (Jan.); *Solenia* ochracea (Feb). Amongst the *Clavaria*, I have found fastigiata, and cristata in Dec., and flaccida in Jan.; and amongst the *Tremellini* I have found mesenterica in Mar., foliacea in Dec., and albida in Jan. and Apr., *Exidia* glandulosa in Jan. and Mar., *Nœmatelia* encephala in Mar., *Dacrymyces* stillatus in Feb.

Amongst the Gasteromycetes, the following I have found in the winter months,—*Batarrea* phalloides (Dec.), *Geaster* fimbriatus (Jan.), *Bovista* nigrescens (Dec.), *Lycopevdon* pyriforme (Feb.), *Lycogala* epidendrum (Apr.).

To turn to the Ascomycetes, the morels seem only to be found in the spring. *Morchella* esculenta (Mar., Apr., and May), semilibera (May), and *Mitrula* alba (Apr.). In the winter, and early spring I have found *Peziza* venosa (Mar.), badia (Feb.), vesiculosa (Apr.), micropus (Mar.), humosa (Dec.), coccinea (Dec.), melastoma (Mar.), pygmæa (Mar.), stercorea (Feb. and May), virginea (Mar.), nivea (Jan.), bicolor (Jan.), cinerea (Jan.), and *Elaphomyces* variegatus in Jan.

I wish to mention, that I have excluded from my remarks any fungi which I found only in November, so that those mentioned as seen in the winter months, were growing when winter may fairly be considered as set in; many others found in the latter end of November might fairly have been included, but I thought it best to draw a line at November.

As an instance of the apparently capricious appearance of some fungi, in seasons which seemingly were equally favourable, some morels grew in great abundance one spring in Kingsweston Park (Gloucestershire,), on a spot where generally a few may be seen. The following spring, which as regards the weather was to all appearances equally, if not more favourable to their growth, being very mild, not a specimen was to be seen.

The common mushroom (Ag. campestris) is often very abundant one year, and the next season, hardly any are to be found. How is this to be explained? Is it entirely owing to the season? or is it caused by the temporary exhaustion of the mycelium, owing to the abundant production of the previous year? The latter cause is, I think, the most probable.

From the season I will turn to the *soil*. Those most favourable, as far as my experience has gone, are the light sandy loams, and shaley, and gravelly soils. On these, fungi are usually more abundant, and better grown; but on clay and other heavy soils, I have never found them in such abundance, or such perfect specimens. In a dry season, particularly, owing to the hardness of the ground, they are often much distorted, from the resistance they meet with in breaking through the surface; and in a very wet season, these soils are chilled more rapidly, and the fungi are unable to grow freely. The lighter soils being naturally freer of drainage, are drier, and warmer, and thus more favourable to their growth. On a heavy soil in Devonshire, *Polyporous perennis* averaged 1 inch to 1½ inches in diameter; but on a light soil in the same county, they grew larger, one I obtained being 3½ inches in diameter.

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The Boleti, as far as I have observed, seem to be more abundant on the lighter soils, but many of the Elvellacei seem to prefer the heavy soils.

Living, as I do, in a district where the soil is chiefly clay, or marl, I am always struck with the scarcity of fungi, compared with those districts where the soil is lighter. I do not, of course, mean that a careful search on the heavy soils will not be repaid, but that the species are not so abundant.

With regard to the *situation* which fungi usually prefer, those in woods are usually most abundant in the more shaded parts, with a southern aspect, where the growth of underwood has been sufficiently long in continuance to hinder the growth of the flowering plants, and to leave the ground tolerably bare.

The thicker the growth of underwood, and the longer it has been left undisturbed by cutting, the more prolific will the soil be in fungi, should the season be a good one. A wet and moist situation is not usually very productive in Agarics, but the soil which is damp, without being actually wet, seems to suit them better.

Ground which "poaches" up when walked upon, and where the water stands in puddles, will seldom prove very productive of fungi, at least of the Hymenomycetes. Some of the Ascomycetes seem, however, to prefer those damp situations, as I have found *Leotia* lubrica, *Peziza* acetabulum, badia, trechispora, and umbrata, on very wet, and damp banks. Often that kind of ground will yield Elvellacei, which is too wet for Agarics.

Certain fungi again, are addicted to the vicinity of particular trees. Firs, oaks, and beech, seem to be most preferred, but elms and ash are not so much frequented by them; morels, however, prefer the latter trees. The reason of this is, perhaps, that the nourishment contained in the decaying leaves of the first-named trees, is more suitable for the growth of fungi, than what is contained in the leaves of the last-named; or else that ash, and elm, abstract more of the constituents from the soil, necessary for the growth of fungi, than do the former trees.

The three S's of Fungology, viz., Season, Soil, and Situation, deserve more attention than they have hitherto received, and I do not doubt, but that more attention will, in time, be paid to these subjects, for I think that fungi have, the same as the flowering plants, their special times of year for appearing, as well as their favourite soils and situations.

THE FUNGI OF OUR DWELLING HOUSES.

[By William Phillips, F.L.S.]

The important part which the minute vegetable forms of life classed as Fungi, are believed by the most competent authorities to play in the production of diseases in the human frame, may warrant a brief account from a botanical point

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of view, of such species of Fungi as have been observed to grow in our dwelling houses. We will confine our attention to those which grow on the structure—the walls, floors, ceilings, cellars, &c.—leaving for some future occasion those which attack food and other substances in household use liable to decay. As it is only in later years that attention has been directed to the study of these curious growths, comparatively little is known of their life history, so that for the present we must content ourselves with knowing something of their structure and place of growth only, awaiting the progress of future discovery to reveal to us the deeper secrets of their being. The difficulties of pushing our investigations further are very many, partly on account of the minuteness of their reproductive organs, and partly on account of the length of time necessary for such investigations. Much, however, has been done in the way of patient observation, both in this country and on the Continent, and the large number of earnest workers will doubtless tend to throw much light on this interesting subject.

Our present object is to place before you a list of all the species coming under the designation of our paper, offering a few remarks on some of the more important and interesting ones. The list contains forty-six species, varying very much in their character, arranged in the order in which they are usually placed in English hand-books.

The first thirteen are not only the first in order, but the first in importance, containing amongst them the species which are the dread of all who are interested in house property, producing the well-known dry-rot. The one specially credited with this evil is *Merulius lacrymans*, the Dry-rot Merulius; but some others, as *Polyporus hybridus*, Dry-rot Polyporus, and *Polyporus destructor*, Destructive Polyporus, sometimes commit similar ravages. It is not always possible to determine the species by which the injury is done, because it does its work in the rooting stage (mycelial stage) of its growth, while the perfect plant is as yet undeveloped. The evil effects of these fungi, however, are all popularly designated dry-rot.

This destructive disease of timber is capable of reducing the largest and smallest beams alike to dry and dusty masses which will crumble under the slightest pressure. The whole texture of the wood becomes permeated with the mycelial threads of the fungus, which have the effect of decomposing it and rendering it utterly worthless. It has the power, also, of infecting sound wood in its vicinity, so that it will spread irresistibly throughout the basement storey of a house, or the deck of a ship, rendering the whole fabric unsafe. Much has been said and written about dry-rot, as will be seen by a reference to any of our cyclopædias; and various are the opinions which have been expressed by different writers as to the cause and cure of this disease. It is impossible, however, on this occasion to do more than briefly allude to the subject, leaving its more complete discussion to those who make it a special study.

Merulius lacrymans, of which we have a striking specimen before us, kindly lent to me by Mr. Jenner, of Easter Duddingston Lodge, Edinburgh, commences

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its growth on the side of the wood concealed from the light, where it developes a soft mass of entangled threads somewhat resembling lamb's wool. In this specimen the mass is 1½in. thick, extending 26in. by 19in. over the surface. At the joinings of the woodwork it has found its way to the light by thrusting itself through the dovetailing, and has spread its fruit-bearing surface over a space of 18in. by 13in. Two other points of growth have commenced, which in time would doubtless coalesce with the first, and cover the whole of the upper surface of the boarding. The piece of wood on which this specimen is growing, was removed from a cottage wall on Mr. Jenner's property, and exhibited by him at the late meeting of the Cryptogamic Society of Scotland, held at Forres. A room in the cottage had been lined throughout with pine-wood similar to the piece exhibited, and in a short time after, the fungus made its appearance on the surface. Mr. Jenner has since had the whole of this lining removed and burnt in order to prevent further mischief.

We have been favoured with some very valuable and original observations on the nature, origin, and treatment of this disease of timber, by a member of the Cryptogamic Society of Scotland, Mr. John Young, C.E., who has had a striking case of its occurrence under his observation, and, as the narrative of an actual conflict with this formidable foe will convey to you a better idea of it than anything we can say, we will quote his own description of the case. Mr. Young says—"I had to do, professionally, with a house in which dry-rot showed itself, about six or seven years ago. The house is one of three storeys. The lower storey was on a level with the street. When the river in its neighbourhood rose high it was subject to be flooded. In order to escape the flooding, the proprietor resolved to build a wing to the back, and raise the floor level of the old and new building. In carrying out these alterations, earth was required to raise the floor of a passage, and to this circumstance I trace the importation of the fungus; as when the floor came ultimately to be opened up, large quantities of old bits of wood were found amongst the earth, on which the fungus seemed to revel. The material had been thoughtlessly brought from the ruins of some old house. Every care had been taken to secure full and complete ventilation under the new floor, by means of pipes and gratings of perforated zinc, so that there was no confined air, but always a strong draught prevailing. Dry-rot was never seen before this in the neighbourhood of the house in question. In two years or so after the alterations, the skirting of the wooden floor was found to be much affected, and on tearing up a part of the floor next the passage, the joists and lath partitions were found in a diseased state. A tradesman was called in, and the matter entrusted to him. It was found to be confined to one corner. This corner was cleared out, part of the wooden partition taken away and rebuilt with brick, and an additional ventilator put through the front wall, and in fact the tradesman pronounced the disease cured. But in another couple of years, to the dismay of the proprietor, the cure seemed to prove worse than the disease. The additional ventilator, which was supposed to be essential to the destruction of the plant, seemed to be its very life, as it was found in beautifully developed form, shedding its spores with rare luxuriance, not

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only about the wooden floor, but in an open and well-ventilated apartment on the floor above, also around the sash of an adjoining pantry window, and even on the crevices of the stone division wall outside the house. This latter circumstance was considered a rare occurrence, as wood was always deemed essential to the growth of the Merulius. But in this instance, so rampant was its growth, it seemed to rejoice in its strength, and decline to restrain itself within the usual limits of its prescribed habitat. In fact, I found its long, stringy, and leathery branches spreading in the heart of the two-feet thick rubble wall of the house, built closely with stone and lime, and extending up the heart of the wall and throughout its thickness for two or three feet from any wood. It was always in its dried-up state however, that I found it in a wall; and my belief is that it had its mycelium, or root, in wood originally, which had been now exhausted of the qualities necessary to feed the fungus. In the division wall outside it was thought that in the crevices there had been some particles of a ligneous nature for the roots to attach themselves to. In the storey above the ground floor, near the pantry, there was a wooden sink lined with lead, and there it revelled most gloriously, and also about the skirting of the floor immediately beside the sink. There was a window above the sink immediately over the window of the pantry on the ground floor, affected; in fact the sink, the pantry window, and stone wall between them were literally permeated with the fungus; and wherever it got light and room to develope, the space was covered with spawn. What was to be done? I tried first of all cleaning away every trace of fungus, and saturating the wood with carbolic acid, but in a few days it showed itself as luxuriantly as ever. I now resolved to stamp it out, so to speak. I cleaned away the wooden floor, lifted the flag-stones of the passage, removed the wooden window of the pantry, and substituted for it one of zinc; replaced the wooden cistern case (saw-box) with one of delf, took away every part of the ceiling of the pantry and floor over it, and skirting; laid the floor of Portland cement, and supported the joists with an iron beam, cut off their connection entirely with the wall, filled up the two or three feet under, where the wooden floor was, with lime and stones, first burning the soil under it, and laid a new floor of cement concrete; cleaned the outside division, and cemented a large portion of it, and made the partition walls brick. In short, I removed every particle of wood that I thought would be likely to come in contact with earth, pavement, or wall. It is now three years since this was done. I have examined it regularly, and have seen no trace of fungus since; so that I feel confident I have cured it. I found, in lifting the passage pavement, that wherever a piece of wood, however small, was seen in a somewhat healthy state, mixed with the *débris* that had been brought to make up the level, there it had its root, and its growth was spread over the pavement and surface of the earth in beautiful silvery threads. And in other instances, where a very far-gone bit of wood was found, there was either no fungus, or, the wood having been exhausted, the fungus was clinging to it in a dead and dried-up state.

"From the whole, I draw these conclusions:—

"1.—That wood is necessary for the root, or first production of the fungus.

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"2.—That the wood, after a time, gets exhausted of its nourishment for the fungus, and when this is the case the plant attached to it dies.

"3.—That if it has wood for its root, its branches will luxuriate where there is no wood, even in the heart of a well-built dry rubble wall, but when the wood at the root is exhausted, it dies in the wall.

"4.—That the wood in which it takes root requires a certain amount of damp.

"5.—That where the conditions are favourable, free ventilation is not against its growth, on the contrary, a draught aids it in dispersing its spores.

"6.—The cure is to eradicate it as far as possible, by burning the soil, applying a flame to the walls, and removing every particle of wood from its locality, and substituting stone, iron, or cement.

"7.—I believe that upon good, perfect, dry, healthy wood, it would not readily take root, but if it gets good root in dampish wood, its growth will ramify over dry fresh wood, and prey upon and destroy its tissues, thus ruining it for all structural purposes."

We feel sure you will agree that these facts, based as they are on actual observation, and affecting as they do all who have to do with building and occupying dwelling houses, are of the utmost value and importance, and forcibly illustrate the mischief fungi are capable of producing.

When any of the members of this group attain a perfect state, they have the power of depositing countless multitudes of spores, capable of reproducing, in favourable circumstances, a progeny totally beyond calculation. The second on our list, the Radiating Coprinus, is a striking example of this power. If the head of one be removed from the stem and placed with the gills downwards on a sheet of white paper, a deposit of black spores takes place in a few hours, completely covering the space beneath, leaving a pefect diagram, showing every individual gill as if photographed. Mr. Worthington Smith has estimated the number of spores produced by a very much smaller species than this one at three millions. What number this larger species is capable of producing we will leave to the imagination of our hearers.

The next twenty-three species in our list (14—36, to which 44 and 45 may be added) comprise those which are known as microscopic fungi, being so minute that they require a magnifying glass to see any of the details of their structure. They may be none the less formidable, however, in their effects on health. When it is remembered that the potato disease, *Peronospora infestans*, the hollyhock disease, *Puccinia malvacearum*, the coffee disease, *Hemileia vastatrix*, together with many others that may be mentioned, are all microscopic fungi, it will be admitted that mere size is not indispensable for effecting much injury. Nearly all this group are found on damp wall paper, or damp plaster, and produce the discolouration so frequently seen when moisture finds its way through or on to a wall. To one unacquainted with these minute organisms it will be a matter of surprise to be told

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that what looks like a patch of dirt or dust is in reality a curious little forest of vegetation, of various species, which spring up, flourish and decay, in the course of a few months, one crop following another in continued succession, the more minute making way for the larger and more conspicuous species. There is not more dissimilarity in the trees of an ornamental park than can be seen in these minute growths, each plant having its own characteristic outline and peculiar fruit. Many of them are exceedingly beautiful, and will well repay the examination of those who possess a microscope. We will confine our remarks to one species (No. 30 in the list,) which is known to most people. I allude to the cellar fungus, *Zasmidium cellare*. This fungus, which forms the sombre drapery hanging over the arches of old vaulted wine cellars, and in undisturbed bins in which are deposited special vintages only to be produced with pride on festive occasions, consists of a mass of entangled threads, bearing on certain parts spherical vesicles not larger than a pin's head, of a brittle carbonaceous texture. These vesicles are the sporangia, filled with minute spores, destined to reproduce the species.

By the kindness of Mr. Allen Harker, of Gloucester, we are able to exhibit to you some specimens from the bonded cellars of that city, bearing fruit. One of the specimens varies from the normal colour, being of a rusty brown. This colour arises from its being impregnated with a solution of some salt of iron. Mr. Harker says, "I have analysed the incinerated ash, and find iron in large quantities." The only injurious effect of this fungus is that it occasionally penetrates the corks, rendering recorking necessary, but not injuring the wine. Time will not allow of our saying anything about the many interesting species contained in this group, besides which, it would be difficult without drawings to give anything like an adequate notion of their interesting and often elegant structure.

The last group in our list to which we would direct attention are the cup-shaped fungi, of which there are eight species, (Nos. 37 to 44,) found on damp wood or walls, in various places about dwellings not properly cared for. Their form is that of a minature tea cup, from the fraction of an inch to two or even three inches across. The colour of several is of a sober drab or dirty white. They appear on the vertical surface of wood or walls, often on ceilings, attached by their base, at which there is often a manifest development of white, root-like threads (mycelium), to which they owe their origin. No. 39 in our list, called Balfour's Peziza, is a pretty, purplish-white species, about one inch across. It occurred, for the first time it had been noticed, on the walls of Inverleith House, near Edinburgh, occupied by Professor Balfour. This house had been burnt down previous to the Professor's occupation of it, and gave evident signs that it had never become thoroughly dry since. Indeed, the presence of any in this group indicates a confirmed state of dampness, quite incompatible with a healthy condition of a dwelling house.

We have thus briefly glanced at a subject which deserves much more extended notice, especially that part of it which relates to their sanitary influence. It has been established, beyond doubt, that the spores of fungi are capable of producing evil effects, such, for example, as those of the common puff-ball when

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passed into the lungs by breathing, and it is not unreasonable to conclude that many of these household species may exert a like evil influence. The case of one of the assistants in the Botanic Gardens of Edinburgh having experienced injury from this cause, and the fact quoted in that admirable little book entitled "Fungi: their Nature, Influence, and Uses," as to the black rust of the seed, *Arundo donax*, producing eruptions on the skin, point clearly to this conclusion. Who shall say how many of the ailments of children, as well as grown people, may be attributed to this cause, though never for a moment suspected. The showers of invisible spores thrown off by a patch of black mould the size of a human hand may fill the atmosphere of a room with disease-producing bodies none the less potent because they cannot be seen. Besides this, as we have already shown, the presence of fungi invariably indicates a state of unwholesome dampness in the apartment where they are found, suggesting the necessity of better drainage and ventilation. They thus perform for us, in one way, the office of a friend, by warning us of the unhealthy condition of our house; while, if such warning be despised, they may become our most formidable foes.

HYMENOMYCETES.

1.—*Coprinus aphthosus*, Fr. Scaly Coprinus. On decaying moist wood in cellars, cold kitchens, &c.

2.—*Coprinus radians*, Fr. Radiating Coprinus. On plaster walls.

3.—*Coprinus domesticus* (Pers.). Domestic Coprinus. On damp carpets.

4.—*Lentinus lepideus*, Fr. Scaly Lentinus. On rafters.

5.—*Panus violaceo-fulvus*, Batsch. Violet-brown Panus. On wood in cellars; not British.

6.—*Polyporus destructor*, Fr. Destructive Polyporus. On worked wood in houses.

7.—*Polyporus cryptarum*, Fr. Cellar Polyporus. In cellars; not British.

8.—*Polyporus hybridus*, B. and Br. Dry-rot Polyporus. On oak in houses and ships.

9.—*Polyporus Vaillantii*, Fr. Vaillant's Polyporus. In cellars.

10.—*Merulius lacrymans*, Fr. Dry-rot Merulius. On beams and wood in houses.

11.—*Stereum hirsutum*, Fr. Hairy Stereum. On damp wood and water butts.

12.—*Corticium puteanum*, Schum. Well Corticium. On damp wood in cellars, wells, &c.

13.—*Corticium aridum*, Fr. Parched Corticium. On pine wood in houses.

MYXOMYCITES. (Slime Fungi.)

14.—*Lycogola parietinum*, Fr. Paper Lycogola. On paper.

CONIOMYCETES. (Dust Fungi.)

15.—*Torula murorum*, Cord. Wall Torula. On walls.

16.—*Sporidesmium alternariæ*, Cooke. Paper sporidesmium. On damp wall paper.

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HYPHOMYCETES. (Thread Fungi.)

17.—*Isaria furcellata*, Mont. Forked Isaria. On chips in cellars; not British.

18.—*Stilbum typhinum*, Wallr. Tub Stilbum. On vinegar barrels; not British.

19.—*Sporocybe alternata*, B. Alternate Sporocybe. On damp wall paper.

20.—*Stachybotrys atra*, Corda. Black Stachybotrys. On wall paper.

21.—*Macrosporium cheiranthi*, Fr. Common Macrosporium. On damp wall paper.

22.—*Aspergillus glaucus*, Lk. Blue Mold. On anything damp.

23.—*Aspergillus roseus*, Lic. Pink Aspergillus. On damp wall paper, carpets, &c.

24.—*Rhinotrichum lanosum*, Cooke. Woolly Rhinotrichum. On damp wall paper.

25.—*Penicillium chartarum*, Cooke. Paper Penicillium. On damp wall paper.

26.—*Oidium chartarum*, Cooke. Paper Oidium. On damp paper.

27.—*Sporotrichum sulphureum*, Grev. Sulphury Sporotrichum. On wood in cellars, &c.

28.—*Sporotrichum fenestrale*, Dit. Window-glass Sporotrichum. On glass in windows.

29.—*Myxotrichum deflexum*, B. On damp wall paper.

PHYSOMYCETES. (Vesicle-bearing Fungi.)

30.—*Zasmidium cellare*, Fr. Cellar Fungus. In cellars on walls, bottles, corks, &c., &c.

31.—*Mucor phycomyces*, Berk. Shining Mucor. On greasy walls, fat, &c.

32.—*Mucor mucedo*, L. Common Mucor. On fruit, paste, and many other things.

ASCOMYCETES. (Ascus-bearing Fungi.)

33.—*Perisporium princeps*, B. Princely Perisporium. On old beams.

34.—*Chætomium murorum*, Corda. Wall Bristle-Mould. On plaster walls.

35.—*Chætomium chartarum*, Ehb. Paper Bristle-Mould. On damp wall paper.

36.—*Chætomium glabrum*, B. Smooth Bristle-Mould.

37.—*Peziza viridaria*, B. and Br. Greenhouse Peziza. On damp plaster walls.

38.—*Peziza tectoria*, Cooke. Plaster Peziza. On damp plaster walls, similar to the preceding.

39.—*Peziza Adæ*, Cooke. Balfour's Peziza. On damp walls.

40.—*Peziza cretacea*, Cooke. Chalky Peziza. On plaster ceiling.

41.—*Peziza domestica*, Sow. Domestic Peziza. On damp wall paper and on plaster.

42.—*Peziza Pigottii*, B. and B. Pigott's plaster Peziza. On plaster ceilings.

43.—*Peziza hæmastigma*, Fr. Blood-red Peziza. On walls.

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44.—*Peziza Bullii*, Smith. Bull's Peziza. On water butt.

45.—*Orbicula cyclospora*, Cooke. Paper Orbicula. On varnished wall paper.

46.—*Orbicula perichoenoides*, Cooke. On beams in old houses.

ON THE IMPORTANCE THAT SHOULD BE ATTACHED TO THE DEHISCENCE OF ASCI IN THE CLASSIFICATION OF THE DISCOMYCETES.

[By Monsieur E. Boudier—Translated by W. Phillips, F.L.S.]

The discovery of the mode of dehiscence of the Asci in the Discomycetes is of recent date. Leveillé in the article *Peziza* in the Dictionnaire d'Histoire Naturelle de D'Orbigny, confessed he had never seen it, and it is to M. M. Crouan that we owe the first observations on the subject. These gentlemen saw clearly the operculum in the Ascoboli, and in some neighbouring species, but said they had never met with it in any other Pezizæ. They also made it the special character of Ascobolus, and joined some species of the neighbouring genera amongst which they had observed it. More recently, in their "Florule du Finistere," in 1867, they imperfectly saw another mode of dehiscence in *Lecanidium atrum* (=Patellaria atrata Fr.), but they described it badly, for the sporidia, in all the Pezizæ, are discharged at the same time. The observations of these scientific men rested here, and they did not attach sufficient importance to their discovery.

Since this period, in 1869, in my "Mémoir sur les Ascobolés," I have pointed out the fact that this group was not the only one in which the asci may be provided with an operculum, and that this mode of dehiscence was to be met with in Pezizæ of the sections *Humaria*, *Sarcoscypha*, *Aleuria*, and likewise in *Verpa*, *Helvella*, and *Morchella*, while *Helotium* and the neighbouring genera *Leotia*, *Mitrula*, and *Geoglossum* presented a different mode of dehiscence.

At this time, after the examination of a considerable number of Discomycetes, I am able to call the attention of mycologists to the necessity of separating this family into two very natural sections, according as to whether the mode of dehiscence is with, or without an operculum. I would call the first section by the name of *Operculate Discomycetes*, or simply *Operculæ*, because in this section the opening of the asci takes place by the elevation of a little lid at its summit. The second I would call *Inoperculate Discomycetes*, or simply *Inoperculæ*, because the exit of the sporidia takes place by a small hole, formed at the extreme summit of the asci, with its margin more or less elevated, but without any appearance of an operculum.

There is no great difficulty in observing this dehiscence, although few authors mention it. A very little attention soon renders it quite familiar, and I consider its careful observation indispensable to a good classification of genera and species.

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In the first division, the *Operculæ*, the dehiscence is accomplished by the formation of a circular slit at the summit of the ascus. The tension produced when at maturity by the increase of their growth causes them to rupture circularly at the summit, following the slit which is formed there, as I have previously pointed out in certain Ascoboli ("Mém. sur les Ascobolés," p. 11, pl. 10, fig. xxxi and 8 and 9), throwing the operculum back by the sudden projection of the contents of the ascus, leaving it generally a little elevated, with one space open or sometimes almost closed. This operculum varies according to the form of the extremity of the ascus. It is convex, when it is round, as in certain *Humaria* and *Ryparobius;* it is flattened, when the ascus is truncate, as in *Aleuria;* it is mammular in the centre, when the extremity presents a similar character to *Ascobolus*.

When the ascus is larger, it often bends on each side, which causes it to appear oval or triangular, as often occurs in *Saccobolus*. In almost all cases it retains its round form very clearly when seen in front, and slighly raised when seen in profile. The circular slip is almost always horizontal, but in a few rare instances it is oblique, as in some species of *Humaria*. In one particular genus, so well named by Mr. Renny, *Ascozonus*, it is perpendicular, and this form caused me to doubt for a long time as to the true place this genus ought to occupy. If it be considered as a slit, it will come in the *Operculæ*, and I am now of this opinion, in consequence of the great affinity existing between this genus and *Ryparobius*. If it be considered as a simple rent of the apex of the ascus, which would not be capable of softening, it will enter into the second section, as I had at first thought. But I repeat, such cases form very rare exceptions to the general rule.

The group of Discomycetes, dehiscing by an operculum, presents some characters which give an appearance of close relationship to all the species belonging to it. Thus the sporidia of all those with which I am acquainted are simple; that is to say, they are without septa, sphærical, or more frequently oval, or elliptical in shape, with their extremities rounded, rarely acuminate. They are often warty and sometimes are reticulated. The consistence of the cups is almost always waxy, less elastic than in the second division, except in some rare exceptions. The hairs, which are sometimes found on the exterior, are generally of a different structure. The greater number of the species are found on the earth, on dung, the soil of old trees, or rarely they are met with on sound dead wood, or on the bark. This first division includes the Morels, the Hevellas, the Verpas, the Peziæ of the sections, *Aleuria*, *Humaria*, many of the *Lachneæ*, *Ascobolus* and the greater part of the genera which are derived from this section.

The second division, the *Inoperculæ*, is clearly separated from the first. There is no longer a transverse or oblique slit at the extremity of the ascus; the extremity itself becomes softened in the centre at the moment of maturity, and the tension which is then produced ruptures it, permitting the escape of the sporidia with the liquid in which they exist. By the fact of this emission, the margin of the opening becomes more or less turned like a collar, either entire or

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slightly toothed, remaining often very visible, as in *P. tuberosa*, *P. rapulum*, and *P. echinophila;* but sometimes also closing together, so that in order to distinguish the opening, it is necessary to prove its existence by squeezing the thin walls of the ascus together, as in the small *Mollisia*, *Mitrula*, &c. Most frequently, the extremity of the ascus presents a broad truncated nipper, very thin in the centre.

The species of this section frequently have sporidia with a tendency to division, or they are clearly divided; and very often they are simple, but become divided at the time of germination. I know of none that are verrucose or areolate; they are rarely sphærical, but most frequently fusiform, more or less elongated, and sometimes club-shaped; many are more or less curved, and in general they are much smaller than those of the species in the first section. The consistence of the cup is more firm and elastic, and much less waxy; the hairs when they exist have a different appearance. The species are rarely terrestrial, being much oftener found on dead wood, dead leaves and stems, and sometimes even on the living branches. This second division includes *Geoglossum*, *Mitrula*, *Leotia*, *Phialea*, *Helotium*, *Lachnella*, *Mollisia*, and all the genera belonging to them.

There exists a little group of ascigerous fungi in which the mode of dehiscence is not yet well known: I allude to the true Tuberaceæ, *Tuber*, *Elaphomyces*, and others, that is in fungi completely closed, in which the asci are altogether internal, and cannot discharge their sporidia externally. I think that in this group the asci do not open, but disappear insensibly by absorption, and thus leave their sporidia free. This group, altogether natural and distinct, certainly belongs to the Ascomycetes, but should not be placed in the Discomycetes, from which they differ notably. I may say the same of the Pyrenomycetes in which the greater part of the species probably have dehiscent asci, but this family, in which the processes are most difficult to observe, does not come within the limits to which I confine myself.

It will be seen from what I have said, how much importance I attach to the mode of dehiscence, and it is with the view of inducing mycologists to observe it more carefully, that I have dwelt upon it. There is no great difficulty in observing it, a magnifying power of 300 diameters is sufficient, but it is necessary to search for it at the upper extremity of the open asci. These asci are always to be recognised by the absence of protoplasm, by which they differ from the young plants which have not yet formed their sporidia. Moreover, the tincture of iodine may be employed, which colours the membrane and renders the operculum more visible. This tincture should, indeed, always be employed in the examination of species, because it often gives a deep blue colour at the extremity of the ascus, as in *Aleuria* proper, *P. cochleata*, *P. badia*, *P. vesiculosa*, and others, and the character has a certain value; in other cases the colour is fainter, as in *P. firma*, *P. echinophila*, &c.; in other cases again, only the extreme margin of the opening is tinted, as in *Mitrula*, or it appears as a blue point, while more frequently the iodine does not cause any other colouration than a yellowish tint to be produced.

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I believe these observations are of great use in the natural classification of the numerous species of this difficult family, upon which the efforts of the most able mycologists have been more and more engaged of late. I believe, too, it may prevent other less happy arrangements. I will mention for example *Peziza tuberosa* and *P. rapulum*, which have their asci inoperculate, placed by Persoon and by Fries, and even by modern authors, amongst the *Aleuria*, in which these organs are operculate. Nevertheless these species have something in their aspect nearly approaching *Phialea*, as Persoon in his Synopsis (p. 644) had already remarked "*de intuitu*" of *P. tuberosa*.

The *Lachnea*, *Humaria*, and other genera beside, with operculate asci, contain many species which ought to be withdrawn and placed in the second division.

It is only by examining the species in a fresh state that any perfection can be attained in a study so difficult as the classification of *Pezizæ*. In the dry state these observations are very difficult, and often impossible, in consequence of the contracted condition in which the asci are found.

These two sections in the *Discomycetes* form two parallel series agreeing well in the base. Thus the *Operculæ* commences with the species of a more elevated order, as *Morchella*, *Verpa*, *Helvella*, passing by the *Peziza* in the sections *Aleuria*, *Lachnea*; descending by *Humaria*, *Ascobolus*, to *Ryparobius* and *Ascozonus*; ascending again in the *Inoperculæ* by the small genera of *Mollisia*, *Lachnella*, *Phialea*, as far as *Leotia*, *Mitrula*, and *Geoglossum*; that is to say, almost to the height of the highest species of the first section, only changing very slightly, as I have shown, the classification now generally adopted.

ASCI IN A POLYPORUS.

The Rev. M. J. Berkeley explained at the Conversazione the circumstances under which he found the pores of a *Polyporus* fringed at the margin, with asci containing spores. The specimens had been forwarded also to Mr. C. E. Broome, and he confirmed the observation in all essential particulars. The asci were perfectly naked, and there is not the slightest reason for the assumption that they bore any relationship to *Hypomyces*, or even that they were parasitic in any other manner. There was every appearance of their being a development, of an abnormal character, of the *Polyporus* itself. The explanation was offered in the hope of inducing further research in the same direction, so as to obtain some clue to the cause of a phenomenon so unusual and unexpected. See also *Gardener's Chronicle* for Nov. 16th, 1879.

A NEW GENUS OF DISCOMYCETES.

[By M. C. Cooke.]

The Discomycetes are a large group of fungi which form a portion of the order of Ascomycetes. The substance of which the fungus is composed is of a fleshy or

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waxy nature, very similar to the soft flesh of many of the Agarics, and never hard, corky, or brittle, as in most of the Sphæriacei. It is true that some genera of the Sphæriaceous group, such as *Cordyceps* and *Hypocrea*, have a similar fleshy substance, or stroma, but in these we recognise another point of difference, in the asci being enclosed within definite perithecia, which are embedded in the stroma, whereas in the Discomycetes there are no perithecia, the hymenium being always continuous over the fructifying surface. The form of the Discomycetes is doubtless variable, but this follows two types, the one pileate, the other cupulate, the one club-shaped, the other cup-shaped, with their various modifications. In the latter the hymenium lines the concavity of the cup, in the former it is spread over the outer upper surface, being deficient in the stem. There is no exception to this general rule, so that it is never difficult to indicate the position and limits of the hymenium. They are, therefore, fleshy ascomycetous fungi, with the hymenium or fructifying surface confined to a definite area, but never enclosed in perithecia.

As in all other branches of natural history we encounter aberrant forms, which possess great interest because they depart from the general type, so here, amongst the Discomycetes, I have to describe an aberrant form, which possesses a general interest to the mycologist as a new arrangement or inversion of parts or organs.

In 1874 and 1875, Dr. Berggren, of Lund, visited and collected in New Zealand, and amongst others, he obtained a large and interesting collection of fungi, and made about one hundred rough water-colour sketches. These fungi have passed into my hands for determination, and among them the subject of this communication, together with two "sketches from the life."

The fungus, which I purpose calling BERGGRENIA, is ovate, pyriform, somewhat clavate, about one inch in height, and nearly as much in width, but compressed laterally to one-fourth of that thickness in one direction. It is described as looking very much like a *Tremella*, being a little plicate or ribbed below and inflated, so that the centre is hollow, and though attenuated a little at the base there is no distinct stem. The base is watery white, the upper half a bright reddish orange.

For some time I was puzzled with this, which at first I regarded as a *Tremella*, or *Guepinia*, or it might be an ally of *Spathularia*; softened and examined under the microscope I could find no external trace of hymenium, nothing but a tough cellular tissue of large and uniform cells, until at length almost in despair, I cut open one of the specimens, and found the inner walls softer, rugose, and so different in texture that at once, more out of curiosity as to the character of the cells, than hope to find the hymenium, I examined a portion of the inner wall, and found it to consist entirely of an effused hymenium of large, closely-packed, cylindrical asci, each containing its eight elliptical sporidia, but without paraphyses. In fact here is an inflated fleshy sac, with the hymenium enclosed and covering the whole of the inner surface. It is a *Spathularia* turned inside out, and is of far more importance to us than a mere new species or a new genus could be, present-

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ing to those who are acquainted with the structure of the Discomycetes a most interesting subject for study and reflection, adding yet another to the contrarieties of the Antipodes.

It may not be out of place to allude to the affinities which this new fungus seems to present. There is no doubt whatever that the hymenium is entirely enclosed, although both figures and specimens exhibit ruptured individuals in which the hymenium is laid bare; but if we consider that in a perfectly closed specimen the hymenium was fully matured, there is no reason to conclude that a wholly enclosed hymenium is not its normal condition. Perhaps *Sphærosoma* comes nearest to *Berggrenia*, except that it has a thicker and firmer periderm, and is moreover hypogæous. This affinity is sufficient to prove that it is not impossible for a plant of such a structure to be a Discomycete, and Tulasne considered *Sphærosoma* to be a Discomycete, although evidently so very closely related to *Genea*. Indeed, in my opinion, *Sphærosoma* is further removed from the Discomycetes in the direction of the Tuberacei, than *Berggrenia* from some species of *Peziza*.

There is a great similarly in the character of the fruit, and in the fleshy stroma, as to texture, &c., between *Cyttaria* and *Berggrenia;* in fact, the latter resembles the former, inverted, and the areolæ suppressed. The hymenium is confined in some *Cyttariæ* to a few nearly closed cells, and although the relationship is by no means close in any direction, I am inclined to place *Berggrenia* in the *Bulgariacei*, nearest perhaps to *Cyttaria*. The discovery, hereafter, of intermediate links may render the affinities clearer than at present they seem to be; under any circumstances, the new genus has a higher interest than its mere position in any system of classification.

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A FLINT FLAKE AND ITS STORY.

[By W. G. Smith—*Gardener's Chronicle*, May 4th, 1878.]

The flint flake illustrated above was picked up a week or two ago by the writer on the Sussex downs near Eastbourne. Similar flakes of flint are far from uncommon at the place mentioned, and they are to be found in certain positions all over Britain, and probably indeed over the entire world. Flints which have naturally burst or become splintered in their original matrix of chalk, or have been broken for roadmaking by the roadside, are to be seen almost everywhere, but the worked flint illustrated—a scraper—differs from these, inasmuch as it was carefully worked into shape by human hands some thousands of years ago, and probably before metals were known in this country. Mr. Evans has computed that the more recent of these instruments of stone were made 1,000 or 1,200 years B.C., and continues: "How much further back their use might be carried it is impossible to say."

The flint illustrated was without doubt worked into shape on the spot where it was found, as it was picked up on a known British Camp, and was in company

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with a large number of other stone implements and flakes. At first sight it seems somewhat curious that these objects of antiquity should still be resting on the surface of the grass, and nestling amongst the common plants of chalky downs. The surface-soil where this flint was found varies from an inch or two to a foot or more in thickness, and one would imagine that in a minimum number of years, amounting to 3,000, the decomposition of the plants, the action of worms and their casts, as described by Mr. Darwin, and the dung of birds and other animals, would ere this have effectually covered flints of the size figured from sight, but such is not the case.

I have found many worked flints on the Chiltern Hills, resting on the surface of the ground where the earth had been thrown out in pre-historic times for the formation of huts. When flints are first taken from the chalk, they are encrusted with a white external stratum which is due to the decomposition of the flint, the decomposition taking place from the outside inwards; if a flint is freshly broken it shows a black or coloured internal mass, which will in its turn, at length become white and porcellaneous by the decomposition of the surface, *i.e.*, if the flint is kept in the air or in a porous soil. All the worked flints on the Sussex downs are white from their many long years of exposure. In the accompanying illustration, the left hand figure shows the front and worked face of a flint, probably used in pre-historic times for scraping the skins of animals: the right hand figure shows one edge of the implement, and the lower figure its transverse section; the back is unworked, *i.e.*, perfectly plain. Many of the worked flints near Eastbourne show part of the original crust of the flint, as the one does now under description. When our implement was in process of manufacture, the flakes struck from the face for some reason fell short and stopped suddenly at the point A, leaving a piece of the original decomposed crust, which is clearly seen on the section at B, and also seen covered with lichens on the front and side view, F G. How long this thickness of crust required for its formation whilst the flint was still in the chalk it is impossible to say, but the time that has passed since the flint was first worked has been sufficient for the formation of a second and much thinner white porous and porcellaneous crust, as seen at C C in the section. On a freshly fractured flint it is probable that no vegetable life of any sort could exist, but as soon as the surface becomes roughened and abraded by the weather, as on old window glass, vegetable life of a low order gains a footing, and more or less hastens the decomposition. So absorbent of moisture are some old and decomposed flint flakes, that they will weigh one-twelfth more after being placed in water, than when in a dry state. This slight retention of water is sufficient to support a few unicellular algæ, and other plants of a low order. Growing on our Sussex Downs flint, there are no less than four lichens. The surface which has been worked is not yet sufficiently decomposed to support fully developed lichens, the black patches at D therefore, belonging to *Verrucaria nigrescens*, are invariably sterile, as are the small *olivaceous pustules* at E, which belong to the rudimentary condition only of *Lecanora gibbosa*. On the piece of original crust, however, and where more water is retained, the moisture enables *Leeanora parella* at F F to grow with

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considerable and perfect luxuriance, and even *Parmelia perlata*—G (a lichen commonly confined to trees) to obtain a secure and permanent foot-hold. Who can tell how many more thousands of years must pass away before the worked surface of the flint, which dates from pre-historic times, will be in a condition ready to receive the parasites luxuriating on the fragment of the far more ancient original crust? It may be asked how is it known that this fragment of flint was worked by man in times dating back to extreme antiquity? The reasons are several:—1. Rude implements of similar form are still made by the Esquimaux. 2. Worked flints show the spot where the blow was administered which struck off the flake, as at H. 3. The flakes display a conchoidal curve with a bulb of percussion on the plain face, as at J. 4. They are, as a rule, trimmed or worked on one side only, and, 5, each facet of the face shows a depression (as at K) which corresponds with the bulb of percussion present on each secondary flake which has been struck off. Geologists and evolutionists are always asking for time, they are always stating that the time of the historical period has not been sufficient for bringing about changes of any magnitude. In the Sussex Downs flint we then have an instance of how "geological time" is sufficient to produce a surface on a flint, suitable for the growth of one of the most humble of plants, whilst time dating from remote pre-historic periods is quite unequal to any such result.

FUNGUS FORAY, 1879.

For a full report of the fungi found during the foray, see "Grevillea," Vol. 8, pages 73 and 109.

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Woolhope Naturalists' Field Club.

APRIL 15TH, 1880.

THE annual meeting of the Naturalists' Field Club was held on Thursday, April 15th, in the Club-room, at the Free Library. Amongst the members present were—Mr. A. Armitage (President), Mr. J. H. Knight (President-elect), Mr. G. H. Piper (President of the Malvern Field Club), Mr. Edwin Lees (Vice-President of the same Club), Dr. Bull, Dr. Chapman, Dr. McCullough, Mr. J. G. Morris, Mr. W. A. Swinburne, Rev. James Davies, Rev. W. Bowell, Rev. C. H. Bulmer, Rev. G. H. Clay, Mr. Joseph Carless, Mr. T. Curley, Rev. W. C. Fowle, Rev. H. T. Hill, Rev. W. A. Horton, Dr. H. James, Rev. A. Ley, Rev. H. T. Mogridge, Mr. H. C. Moore, Mr. O. Shellard, Mr. Theo. Lane (Secretary).

The financial statement of the Club, and that also of the *Herefordshire Pomona*, were presented and read. The meteorological tables, with the rainfall and register of flood water on the Wye for the year 1879, were laid on the table.

The volume of *Transactions* for 1874-75-76 were distributed to the members present, and the ten plates containing drawings of forty varieties of fruit, which have been prepared for Part III. of the *Herefordshire Pomona* were exhibited to the members.

A paper on "The Herefordshire Mosses," by the Rev. Augustin Ley, was ordered to be printed forthwith, and several matters of ordinary business transacted. The Secretary was desired to acknowledge the receipt of the 11th volume of the *American Geological Report*, published by the Smithsonian Institution.

The field meetings for the present year were then fixed as follows:—

Tuesday, May 20th—Herefordshire Beacon.

Tuesday, June 22nd—Buildwas for Benthall Edge.

Tuesday, July 27th (ladies' day)—Chepstow.

Thursday, August 26th—Church Stretton.

Thursday, October 7th—Fungus Foray.

The following gentlemen were elected members of the Club—Colonel Clive, Colonel Peyton, Mr. W. J. Humfrys, Mr. F. R. Wegg-Prosser, and the Rev. W. L. W. Eyre. Other gentlemen were then proposed.

The members then adjourned to dinner, and afterwards the President (Mr. Arthur Armitage) read his retiring address, which was followed by an elaborate paper on "The Crab Apple—its Characteristics and Associations," read by Mr. Edwin Lees, F.L.S., &c., Vice-President of the Malvern and Worcestershire Field Clubs.

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HEREFORDSHIRE BEACON.

[Joint Meeting of Woolhope Naturalists' Field Club, and Malvern Naturalists' Field Club, May 20th, 1880.]

MAY, "flowery May," as poets delight to call it, has again come upon the scene; and birds, insects, and plants are all upon the move—

> "Sweet flowers return to life,
> While bright the sun is beaming;
> Nature with joy is rife,
> The earth with beauty teeming."

With determination to take advantage of an auspicious season, the officers of the Malvern and Woolhope Naturalists' Field Clubs resolved upon a joint excursion to the southern part of the Malvern Hills, and to unite in their studies both Natural History and Archæology.

Thursday, May 20th, was the day fixed upon for the expedition, and the weather fortunately proved the finest that the year has yet witnessed. The Worcester contingent started by rail from the Foregate-street station at an early hour, and at Great Malvern vehicles had been provided to convey the Worcester and Malvern members to the Wind's Point, at the northern base of the Herefordshire Beacon, where they were joined by the Woolhope Club, who, in several carriages, took the route from Ledbury by Eastnor and the Ridgeway, pausing to contemplate the well-known Mistletoe Oak in Eastnor Park. The united party consisted of nearly 60 persons, including a sprinkling of adventurous ladies. Mr. G. H. Piper, F.G.S., President of the Malvern Club, headed his friends, accompanied by Mr. Edwin Lees, F.L.S., vice-president, Dr. Frank Powell, hon. sec., and Messrs. G. Sheppard, Hilary Hill, H. H. Lines, J. Tom Burgess, F.S.A., Rev. — Rivington (Tewkesbury), E. Edgell, Rev. R. P. Hill, J. Greaves, B. Dawson, Capt. J. R. Smith and friend, Capt. J. H. Frowde, W. Madeley, hon. sec. Dudley Club, F. G. Hilton Price, F.G.S., &c.

The Woolhope Club were marshalled by their officers, Mr. J. H. Knight, president, and Mr. Theophilus Lane, secretary.

An examination of the trenches of the Herefordshire Beacon was the firs object, and on the arrival of the Woolhopians the assault was commenced, which proved rather arduous work, as Mr. Lines, who was here the Cicerone, led his friends up the glacis of the hill, where was no regular path, and the highest point is 1,390 feet above the sea level. After reaching the summit of the castrametation, as a north-west wind blew rather sharply, a descent was made into the deep fosse surrounding the citadel, where Mr. Lines, having expanded a large elaborate map of the trenches and earthworks, which he had himself formed with most assiduous care, proceeded to read a paper containing his ideas and conclusions as to the formation of the camp, its age, and its occupants. The following extract from Mr. Lines' paper will present an outline of his views on the subject after attentive study. He said—

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"The central part of this camp has been called the Citadel and Prætorium, but erroneously, for it has none of the attributes of a prætorium, or the defensive capacity of a citadel. Its oval rampart is 415 feet in circumference on the crest; there is barely room for 12 tents on the Polybian system of 25 feet by 12 to each tent, containing in all 87 men. If 200 men were placed shoulder to shoulder, they would form a solid human wall, without space for action, along its rampart, and even if the ramparts had been surrounded by a strong high stockade, an assault with fire-balls would easily have carried it, so that as a strong place of defence it was useless. I cannot entertain the idea that it was ever capable of resisting a resolute assault. I believe we ought to look to a period when it was customary to establish high places of judicature; when the sun, the moon, the wandering stars or planets, and nature-worship was the invariable rule; when an egg was a symbol of creation and the morning of life; else why was this place constructed so weak in defensive power, and yet so significantly constructed in that symbolic shape we now perceive it to be? A line drawn along its centre lies due east and west. 178 feet; the base of the oval is at the west end, and at 30 feet along the central line it is 100 feet wide, and at 30 feet from the eastern end it is 80 feet wide. There can be no mistake as to its symbolic shape, which is entirely different from the mathematic—or rather geometric oblate era of the Romans. I do not think that this is all mere accident, but the manifestation of some occult mystery of an early period, the nature of which is no longer retained by the uninitiated."

Mr. Lines considered the original fortification here to be the work of pre-Roman times, though afterwards much enlarged by the different forces that occupied it as warring circumstances required. The unremitting valuable personal efforts of Mr. Piper, the President of the Malvern Club, had last autumn initiated a course of research, which should be thoroughly carried out by digging the whole citadel from end to end down to its rock base.

Mr. G. H. Piper, President of the Malvern Club, then read a learned and exhaustive paper on the grand castrametation before the view of his friends, and mentioned the various opinions of antiquaries on the subject. As his paper will doubtless be printed *in extenso*, when the Club publishes a full account of the result of the diggings made within the camp, it is sufficient here to say that Mr. Piper was of opinion that the fortification of the hill was the work of the early Britons, and that it was occupied and defended in Roman times, and against the Roman power. Afterwards the Romano-Britons may have garrisoned it.

Mr. E. Lees, in proceeding to speak on the subject, said he had done battle here upon several occasions, and he had now to fight again. The late Dr. Card had written a learned dissertation to prove that Caractacus had formed this defensive fortress, and had actually fought here against Ostorius Scapula, the Roman General. But not a single Roman relic had ever been found within the trenches here, though wherever the Romans had been, they left evident traces of their occupation. The name of Caractacus was very tempting for writers to lay hold of, but there was no evidence of his encampment here, and when the Romans

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invaded Siluria it would have been a useless position to occupy, as Ostorius crossed the Severn near its estuary, and so marched up the valley of the Wye into the heart of Siluria, where Caractacus had to meet and engage him, though in fact the British chieftain slowly retreated into North Wales, where the final conflict took place. But after the Romans had left Britain, there was a dreary period of several centuries, when, as Camden had stated, the country between the Severn and the Wye was a constant battle ground between the intrusive Saxons and the Romano-Britons, then beginning to be called Welsh. The Saxons advanced from Worcestershire, and this fortress lying in their way, must have been occupied and defended by the Welsh, who doubtless enlarged, if they were not the first formers of it. The conflict was almost incessant between the advancing Saxons and the Welsh, and it was not until the early part of the 10th century—A.D. 924 to 939—that Athelstan succeeded in conquering and occupying Herefordshire. A battle or ignominious flight must have taken place at that time, for in 1650 it is recorded that a cottager digging near the Wind's Point found a coronet or armlet of gold adorned with precious stones, which must have been thrown down or lost in flight by the Prince who wore it. The gold of the coronet was valued at £1,000, and the precious stones in it were sold, so it is stated, for £1,500. Such coronets, according to Caradoc of Llangarvon's History of Wales, were worn by the Welsh Princes of the 8th and 9th centuries. The Saxon King Offa had advanced into Herefordshire before Athelstan, and must have taken this fortress in his way; but he did not maintain his conquest, and the Welsh regained the ground that they had lost. It was clear, therefore, that the occupation of the Herefordshire Beacon as a fortress of defence was subsequent to Roman times, and such a stupendous system of ramparts and trenches could scarcely have been formed for a mere temporary purpose, but must have been garrisoned whenever any invading force was apparent.

Mr. F. G. H. Price, of London, next read a detailed account of all the articles and relics that had been found in the excavations made last autumn at the summit of the Beacon camp. Much broken pottery had been met with, both of the early British and Romano-British date, a few flint instruments, hones for sharpening purposes, and sling-stones, but not a single coin. A quantity of bones had also been met with, which had been subjected to the examination of expert anatomists, but the osseous remains were all those of domestic animals, unless some relics of deer might be deemed an exception. Mr. Price referred to the broken state of a part of the western defences, where some observers had thought the camp had been stormed from that quarter, but the appearance he thought was only caused by the natural effects of denudation.

At the conclusion of Mr. Price's paper, which had been heard with much interest, Mr. Lees moved a vote of thanks to that gentleman for the great pains he had taken in the examination of the relics exhumed, and this was accorded by acclamation, and Mr. J. H. Knight, President of the Woolhope Club, in bland terms, expressed his thanks for the courteous and welcome hospitality the Herefordian visitors had experienced.

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The party then descended to "Clutter's Cave," mentioned by Dean Stanley as a recess where some recluse from Little Malvern Priory had once told his beads, though its dark and dirty aspect did not present an inviting view, unless mortification was the object intended. So the ladies and most of the assemblage descended into the glen below, where is a huge boulder of syenitic rock, which Mr. Lines, in his imaginative way, designated "The Stone of Divination," or sacrificial stone, and supposes that grey-bearded Druids, in ancient British times, here expounded mystic secrets to an awe-struck multitude that filled the terraced hollow where this broken rock now stands. No doubt it rolled down the hill at some distant period; but if ever Druids gave the rock a voice, no sound could be obtained from it now, and its augury has ceased, unless assailed by a geological hammer. Mr. Lines, however, in support of his idea of this being an "augural stone," has made an attempt to prove that this isolated rock is identical with a boundary mark known in former times as "The Shew Stone," and which is mentioned in a survey of the Forest of Malvern made in the reign of Queen Elizabeth, and the account of which is given at length in Dr. Nash's *History of Worcestershire*. As this "Shew Stone" was certainly stopped at by the riders who were taking the bounds of the Chase, Mr. Lines thinks the exploring party would, in pursuance of old custom, stay here for refreshment or carousal; and above this rock, just at the place where the Red Earl's ditch makes a right angle with its former course, along the rampart of the camp towards the east, are the foundation trenches of some place of refuge, 60 feet by 25, which has been long a puzzle to archæologists. This is a very curious point, and deserves further looking into, but there is "a missing link" in the evidence. No previous observer has given the locality of "The Shew Stone," and it does not at present appear that any old inhabitant of Malvern Chase can point out Mr. Lines' "Stone of Divination" as having from time immemorial borne the name of "The Shew Stone," and one would imagine that such a memorial stone would remain intact for centuries, and its position and name not be lost to tradition.

Leaving this rock, called by Mr. Lines "The Old Pagan Augural," the party moved on to "The Silurian Pass," where there is a bridleway across the ridge, and at this locality the strata, included in what Sir Roderic Murchison has called "The Silurian System," appear in contact with the syenitic rocks of the axial chain, and being apparent on both sides of the hill, Professor Phillips considered the name of "Silurian Pass" peculiarly applicable. Here, by request, Mr. Piper, in the absence of the Rev. W. S. Symonds, who was prevented from being present, gave an instructive outline of the geological aspect of the Malvern chain and the country around, intimating that the researches of Dr. Holl had shown that the fundamental rock of which the hills consisted was of "Laurentian" age, metamorphosed by igneous action, and penetrated by dykes of syenite and trap.

The party then passed onward along the western base of Swinyard hill, to the head of the Gullet Glen, and many ascended to the summit of the Holly-bush hill, and made a survey of the castrametation that here occupies the ground, a single trench only having been excavated around these heights as a defence.

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There was no discussion as to the age of this fortification, and both the President and Mr. Lines intimated an opinion that it was of older date than the camp on the Herefordshire Beacon, but as nothing has been hitherto discovered here, this idea must be held as problematical. Some of the company took an easier course by the side of the hill, and progress was then made to Bronsil Castle. This ruined structure only presents the remains of one of the entrance towers, but the site, which is a tangled mass of bushes, evergreens and weeds, is surrounded by a very wide moat, over which is a narrow bridge. The vicinity is pretty, and near the castle is a modern edifice, the residence of Mr. Hamilton Bailey, who was thanked for his courtesy in allowing an examination of the castle and grounds. The Rev. R. P. Hill exhibited a drawing of the Castle as it appeared before its demolition, and Mr. Piper read an account of all that he could collect respecting its history. He said it was built by Lord Beauchamp, of Powick, in the reign of Henry the Sixth, but was demolished some time in the 17th century. There was an old story that in a vault here was a chest of treasure guarded by a raven, and whoever discovered it would be a fortunate man; but the bones of the last Lord who owned the castle must be first found.

The carriages took up the party at Bronsil, and conveyed them at once to Ledbury, but a pause was made at the Court House, where Mr. Piper had kindly arranged all the articles that had been secured from the excavations on the Beacon Camp, and these, all carefully labelled, were inspected with much interest.

At five o'clock, the United Clubs partook of a plain dinner well served at the Feathers Hotel, Mr. G. H. Piper presiding. When dinner was concluded,

The PRESIDENT in brief but expressive terms proposed "The health of our excellent Queen," which was loyally responded to, and then said that as the Woolhopian members had been examining the Mistletoe Oak in Eastnor Park that morning, he would ask Dr. Bull to give them some account of the Mistletoe, as he had well worked up the subject.

Dr. BULL, in responding to the call, said that he was sorry to find that the Mistletoe Oak in Eastnor Park was in a declining state, and the plant in a less quantity than he had formerly seen it. He must claim Herefordshire as the head quarters of the Mistletoe, and it possessed several oaks with mistletoe upon them, held sacred in Druidical times, and they were very scarce in other counties, and none, he believed in Worcestershire. It had been said that male and female mistletoe plants never grew together on a tree, but he must contradict this, as he had seen them growing together.

Mr. E. LEES reminded Dr. Bull that he had assisted him in hunting up Mistletoe Oaks in Herefordshire, and two had been discovered in Worcestershire. There was a physiological fact respecting the mistletoe which it would be interesting to his Herefordshire friends to examine. Professor Buckman, in a work on orchard trees, had stated that the mistletoe was of advantage in exciting the growth of apple trees, and causing them to produce fruit earlier than they otherwise would. An enterprising firm of nurserymen, Messrs. Smith, of Worcester,

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in accordance with this idea, had been advertising young apple-trees for sale with the advantage of the parasite already growing upon them. Shakspeare had called the mistletoe a "baleful" plant, but it was for experience to decide this.

Dr. BULL, in reply, remarked that mistletoe might stimulate the growth of young apple-trees, but if apples were produced earlier, they would be smaller and deficient in flavour. Orchards oppressed with mistletoe, when they became old, made a very wretched appearance.

Mr. J. H. KNIGHT rose to express thanks on behalf of the Woolhope Club for the kind reception their Malvern friends had given them. The excursion had been a most enjoyable one, and they would all desire many happy returns of the day.

Train time now demanded the return of the Woolhope Club, who accordingly departed, but by the kind invitation of Mr. Piper, the members of the Malvern Club partook of tea at his residence, the Court House, where scientific conversation was kept up, and Mr. Lees exhibited the Cymric chieftain's cup, which, with burned bones, had been found some years since beneath the soil at the summit of the Worcestershire Beacon, showing that cremation was then the burial practice in Britain. The party departed from Ledbury by the last train, well pleased with the events of the day.

CAMPS ON THE MALVERN HILLS.

[By F. G. HILTON PRICE, ESQ., F.G.S., &c.]

THROUGH the kind offices of Mr. George H. Piper, F.G.S., of Ledbury, permission was obtained from the Earl Somers to excavate in any part of the camps on these hills. Accordingly, on the 8th September, 1879, some labourers were obtained, and excavations were commenced in the camp on Hollybush Hill, on the south side of the Malvern range.

This camp is of considerable extent, following the shape of the hills, as camps of this class always do. It has a circumference of 5,700 feet, and a length of 2,000 feet. A deep ditch and a rampart encircle the two hills, *i.e.*, Hollybush and Midsummer Hills, and in the glen between the two, on the south side, is the site of a British town, about 1,100 feet in length. In the interior of the camp on the Hollybush Hill, are many hut hollows, or circles where some sort of habitation probably existed. Some of these were opened, but without making any discovery. On the east face of Midsummer Hill, which is 958 feet high, and considerably higher than Hollybush Hill, are several lines of hollows which have been habitations. Mr. Lines, a well known local antiquary, and who has paid much attention to these camps, states that there are 10 or 11 ranges of terraces, with no less than 214 hut hollows visible, and 30 more under the brushwood. I failed to discover so many, as the hill-side was covered with a dense mass of bracken, &c., which hid the surface from view.

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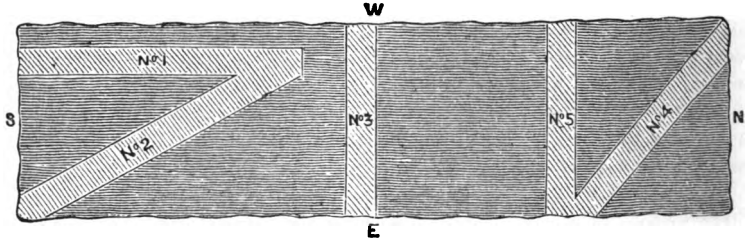
The principal exits from the camp are on Midsummer Hill, leading down to the valley on the north, called the Gullet Pass, and on the south-east in the ravine between the two hills, leading down to the Hollybush Pass. Along this ravine are four tanks or reservoirs having the ancient dams for holding back the water still in existence; they are supplied by two springs which rise in the camp, the first of these dams also forms part of the rampart.

On the south side of the camp on Hollybush Hill, the rampart is much higher, and is strengthened by a second one being thrown up inside it. At this point the so-called Earl of Gloucester's ditch, which enters the camp on the north-east side, running along the ditch of the camp on that side, goes off down the hill, over the Hollybush Pass, and runs up the side of Ragged Stone Hill beyond. Of this ditch I shall have more to say further on.



In the centre of the Hollybush Camp, is a raised mound which has hitherto been looked upon by local archæologists as a "long barrow;" it was mainly for the purpose of digging into this mound that we met on the 8th September. As soon as I arrived on the spot, it was hardly necessary to look at it twice to convince myself that it was no long barrow at all, and, further, that whatever it might have been thrown up for, it was many centuries more recent than the age of the camp.

Mr. Piper was unable to ascribe to it a high antiquity, as its shape indicated it to be post Roman, but said that it had been suggested that it might have served as the place of interment for the slain in some battles or skirmishes of the middle ages, or even of earlier date, as Cymric tribes are supposed to have held the territory west of the Severn until they were driven over the Wye by Athelstan, in the 10th century; then, again, it is known that a great battle was fought on the Malvern hills, and this might have been raised over the slain.

This mound or barrow, which is symmetrical, is situated north and south; it is 150 feet long by 32 feet broad, and about 3 to 4 feet high, and is contained within a slight trench thrown up inwards.

The excavation was commenced at the south end, by running a trench north and south, 2 feet wide, and another on the south-east corner, running diagonally, until it joined the first trench, both being about 60 feet long; these were dug to a depth of about 4 feet, until the surface rock was met with; the earth thrown out,

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although mixed in parts with large fragments of angular pieces of Laurentian rock, &c., was for the most part fine, such as would be found in a garden. Pieces of Upper Llandovery sandstone and quartzoze grit were the only remains we met with that did not belong to the hill, proving to us that it was made-earth we were digging into.

We next made a trench east and west through the centre; this we cut to a depth of four feet, with no more interesting result.

At this juncture thirty or forty members of the Malvern Field Club arrived, who had been invited to inspect the opening of this supposed barrow, by their excellent president, Mr. Piper. Little more was done in the barrow that day, as there were sundry hut hollows, and a circle, that members of the Club requested we should open. These were opened, but with no satisfactory result.*

The next day operations were re-commenced with a view of solving the problem of the barrow; a trench 2 feet wide and 4 feet deep was cut from the north-west corner diagonally across, and another one east and west, in which latter, at 10 feet from the west side, and at a depth of 3 feet, the earth became much blacker as it was thrown up; upon examining it we found it contained fragments of charcoal, cinders, two small pieces of burnt brick, one having the impression of a dog's foot, and a thin copper or bronze ring; this blackness was but a mere patch, as below, the substance of the mound bore the same appearance as what we had thrown out before. Having cut these five trenches, more than equal to twice the length of the whole mound, and finding the result so unsatisfactory, it was soon abandoned.

Some days after, on the 17th, having a few hours to spare, and observing a similar mound on the slope of a hill south-east of the Herefordshire Beacon Camp, a little to the north of the Divination Stone, and due west of Clutter's Cave, I resolved to open it, as it might perhaps throw light on the former one.

The mound measured 89 feet long by 17 feet broad, and 2½ feet to 3 feet in height. It had a north-easterly direction. A trench was cut, 2½ feet wide and 4½ feet deep, from west to east, and from north to south a trench of similar dimensions was dug, extending for 38 feet. All the earth thrown up was of the same quality, being fine and suited to a garden. Whilst occupied at this mound, General Pitt Rivers arrived, whose opinion I at once solicited; he informed me that it would be only waste of time to continue the digging, as he, in company with Canon Greenwell and Professor Rolleston, had opened precisely similar mounds in Oxfordshire, Surrey, and elsewhere, with like results. But whilst at Dartmoor, some years back, he observed some of these raised mounds, and upon making enquiries, ascertained that they were thrown up as artificial rabbit burrows, and had been in use for many years for the purpose with great success. They are even made there at the present day. General Pitt Rivers having fully

* On the eastern face of Midsummer Hill, five of the so-called hut hollows were subsequently opened within the camp. In one, at one foot from the surface, a piece of brick, fragments of charcoal, and a quartz pebble were met with.

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convinced me that this mound, and the so-called long barrow on Hollybush Hill, about which local poets and writers of the guide books had written so much sentimental nonsense upon the remains of ancient British warriors therein interred, had been raised as an artificial rabbit burrow, perhaps a few hundred years ago, I ordered the men to fill up the trenches at once. Notwithstanding two or three days had been occupied in opening these mounds, it was satisfactory to prove that they were of the same character as those which had so puzzled Professor Rolleston, Canon Greenwell, and General Pitt Rivers, until the latter discovered their origin.

I am, however, reminded by Mr. John E. Price, F.S.A., that some significance must be attached to the strange deposit of relics in the long barrow. He remarks that the mound and its contents may be Roman after all, and be an illustration of a *Botontinus*,* or one of the terminal marks which it was the practice of the surveyors of old to construct at the confines of territory or estates. In defining the boundaries of land, the *agrimensors*, or land surveyors, selected various signs, the future discovery of which would make the lines of demarcation clearly significant. At such limits they would deposit not only charcoal, but broken pottery, the latter of various kinds, and often purposely fractured, gravel, pebbles, pieces of metal, coins, pitched stakes, ashes, and lime, over such a deposit they would erect a mound or hillock of earth. Such an elevation of earth might in course of time become destroyed, but the objects so protected would remain, and indicate plainly to the professed surveyor their meaning and intention. It is certainly a coincidence, as my friend suggests, that we should have met with such a deposit in the so-called barrow, and that it should be so closely associated in its situation with the respective boundaries of *territoria*, or, in other words, adjoining counties.

HEREFORDSHIRE BEACON CAMP.

This is one of the largest and strongest earthworks in the country, and has usually been looked upon as of British origin, and I see no particular reason for doubting it at present.

Some archæologists assign it to Caractacus, and suppose it was constructed after the Britons, or Cymri, had obtained some knowledge of the Roman method of castrametation, to oppose the legions under Ostorius Scapula. Another goes so far as to say that the camp was constructed some 400 years before Julius Cæsar landed.

The fortifications enclose the highest hill and the two adjoining spurs, which is well known as the "Herefordshire Beacon." This was carefully surveyed

* Consult the text books of the surveyors in Lachman's edition of the "Gromatici Veteres," 2 vols., 8vo., Berlin, 1848-52, for example—"In limitibus vero ubi rariores terminos constituimus, monticellos plantavimus de terra quos Botontinus appellavimus." "Faustus et Valerius," p. 308: also "Et intra ipsis (the *Botontoni*) carbones et cinus et testa tusa coopernimus, Trifinium quam maxime quando constituimus cum signis, id est cinus aut carbones et calce ibidem construximus et super duximus et super toxam monticellum constituimus." The author of this treatise remarks that even in his day ignorant people often confused such limitary *Botontoni* with sepulchral barrows!

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by General Pitt Rivers, who is author of the annexed plan. A deep ditch and a high rampart encircle the Beacon Hill. The outer rampart is 6,800 feet, or 1 mile 500 yards in circumference; the greatest length from north to south is 933 yards. The whole camp is said to contain 44 acres.

The highest portion of the hill is 1,390 feet,* and forms what may be termed the citadel of the camp.

The natural shape of the top of the hill was probably conical, and has been made to assume its present form by the high rampart which has been thrown up round it. It is surrounded by a ditch about seven feet deep, and broad enough for a chariot to be driven round it. Formerly there was but one regular outlet from the citadel, and that was situated upon the south side, leading by a causeway into the camp. There is now another entrance from the north-east side, but it is probably of modern construction, made for the convenience for travellers, and for cattle. The outer ditch varies in depth from 12 to 18 feet, and the top of the rampart is from 30 to 40 feet in width. Following the ditch on the western side of the hill, we come upon the principal road or trackway from the camp, trending in a south-westerly direction down to the old road, called the Silurian Pass by Phillips. The next way out of the camp is in the south-east corner, which leads down by a zigzag path to the Earl's Dyke, past the Thorn Tree (a well-known landmark on these hills). On the eastern side, below the walls of the citadel, is another outlet, leading through a natural hollow in the hill-side, which is much in the shape of an amphitheatre, at which point man probably aided nature for the purpose of forming a place of assembly.

There are a great many depressions on the surface of the whole camp, which were probably hut hollows.

I am of opinion that the portion of the camp occupying the northern spur of the hill, just above the British Camp here, was fortified by a ditch and rampart at a subsequent period to the formation of the main camp, probably thrown up for the purpose of strengthening it. On the western side of this, are three sallyports leading down to a well at the foot of the hill.

Upon the flat surface at the base of the western slope of the Beacon, is an earthwork of peculiar form: its measurements I have not yet taken; but it is surrounded by a rampart—close by it, in fact passing through a portion of it, is an old trackway leading up to the camp, joining the main road leading from the camp at the western side, trending south-west and joining the old Silurian Pass of Phillips.

Upon the east side of the citadel, and just outside the ditch, is an outwork, thrown up for the purpose of commanding the eastern slope, which the eastern rampart does not effectually do.

On 11th September, in the presence of Mr. Piper and several local archæologists, several hut hollows or pits were opened in the citadel of this camp. The

* Phillips places it at 1,118 feet.

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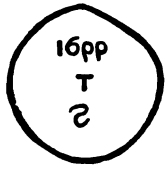
first one was situated a few yards to the eastwards of the centre, and was 10 feet in diameter. This I propose to call Pit No. 1. At the depth of 1 foot were found two small fragments of red pottery, and the base of a vessel of red earthenware, probably of not earlier date than the 16th century. At 2 feet, fragments of red ware and pieces of black pottery—one was a rim of an urn, containing coarse grains of quartz or silex, which was of early date—an iron arrow-head; a fragment of corroded iron; a piece of a flint flake, or strike-a-light. At 2½ feet, a hone stone, and a projectile of pipeclay or limestone of irregular dimensions, and a quartz pebble—the latter was probably used as a sling stone or charm;—an iron nail 3 inches long; a fragment of bone; a terebratula from the Upper Ludlow formation; a bronze ferrule (?); an iron buckle; a tooth of pig, and other bones not identifiable.

We found the bottom of this pit at 3 feet 8 inches below the surface.

Pit 2.—This was a depression in the surface just below the rampart of the citadel, on the east side. The turf was carefully rolled off, and just below was found a piece of sandstone of irregular form with the following inscription engraved thereon:—



At 2 feet down a piece of iron was found, and a fragment of red pottery. At 2½ feet, a red earthenware pot or jug having a brown glaze top with concentric markings round the neck (the handle wanting); this must be of about the 16th century. At 3 feet 7 inches, centre of the pit, a molar of pig, and large stones mixed with clay, and a clay projectile 1½ inches long by 1½ broad and 1 high—weighing 1¼ oz.; and at 4 feet, beneath a stone, mixed with charcoal, teeth of pig and a piece of iron.

On the margin of the pit, at 1 foot from the surface, and 10 feet from the outer edge of the eastern rampart, was a small wall of stones; the ground immediately below it was hard and much discoloured by burning, and contained a quantity of bits of charcoal; the stones of which the wall was composed bore marks of fire.

This place might have been used as a fireplace. Alongside of the stones was a thick stake of wood, apparently driven in with the object of keeping the large stones in position.

This pit was 15 feet long by 9 feet broad, and the bottom was found at 6 feet from the surface.

Pit 3 was on the south-west side of the citadel, and appeared a well-defined hollow, which was opened without any results being obtained.

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Pit 4.—This excavation was made in a hollow in the surface of the citadel, on the north side, close under the rampart. As soon as the turf was removed, the earth was observed to be very black, and many pieces of coarse black pottery were found. At 1 foot from the surface a fragment of iron armour (?), half a horseshoe, and piece of hoop-iron were met with; and at 20 inches, a spur. On September 15th, this pit was continued, and a large quantity of bones were met with of domestic animals. Many of the bones had been split for the supposed purpose of extracting the marrow. The greater number of bones were found at 2 feet from the surface, and the larger was about 1 foot in thickness; this was much mixed up with fragments of coarse black pottery (which may be late Cymric, but difficult to separate from Romano-British); a hone stone (?); and quartz pebbles. At 3 feet, a small whetstone, or burnisher, made out of a piece of slate perforated at one end for suspension, which had been used for polishing arrow-points upon; it is 1½ inches in length; and a piece of the horn of a red deer, 4 inches long, which had been cut with a sharp instrument. These burnishers are very ubiquitous, having been met with by Canon Greenwell, Professor Rolleston, and General Pitt Rivers, in British barrows, &c.; by Dr. Schielmann, at Hisárlik, the supposed site of ancient Troy; in Roman and Mediæval excavations in London and elsewhere; and I am informed that similar articles are made to this day for burnishing. So this little object which I hoped would help to prove the antiquity of the pits, really proves nothing.

Finding such a quantity of bones in this cutting, the trench was extended in form of a triangle, following the line of depression as shown on the surface. It was 3½ feet broad, 27 feet in length from north to south, and 27 feet from east to west. This was evidently a kitchen midden. The bones from this pit I took to the Royal College of Surgeons, where Professor Flower and Dr. Garson, to whom my best thanks are due, took great pains in identifying them.

They are as follows:—

Ox—acetabula, humerus, ribs, portions of jaw, teeth, tibia (one complete, one partially so, one with epiphysis) astragali, and one radius.

Pig—several teeth and jaws, two tibiæ, one humerus and terminal phalanx of foot of domestic pig.

Horse—one tooth.

Sheep—five teeth, humeri, and portion of scapula.

Dog—jaws, teeth, and tibia of dog.

Bird—bones of a gallinaceous fowl.

Deer—metatarsal bones and ulna of Roe.

Deer—astragali, teeth, jaw, forehead (two portions), portion of scapula, portion of humerus, articular head of femur, os calcis, two vertebræ and portion of acetabulum of deer.

Pit 5.—This was a hollow in the surface of the western portion of the citadel; this trench was about 6 feet in length, with a breadth of 2 feet, in a north and south direction. The earth beneath the turf was very black, and at first

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looked a likely place for finding remains in. Two fragments of red pottery were thrown out, but we came upon the rock at 2½ feet down, so closed up the trench.

Pits 6 and 7 were slight hollows on the north-eastern side, a few feet from the rampart of the citadel. Nothing but a few pieces of black pottery, just beneath the turf were found, so the holes were filled in.

September 12th being a wet windy day, two men were told off to make a trench across the outer ditch on the north side of the citadel. This cutting was 12 feet long by 3 feet in breadth. At 2 feet the old surface line was found strewn with fragments of charcoal (some of it was from thorn wood), pieces of Upper Llandovery sandstone flags, and a rounded quartzite pebble. It is surmised that these pebbles, which are not met with nearer than the Severn, may have been sling stones.

The next section was made in the outer ditch on the western side of the camp, where the level of the ditch and top of the rampart are equal. I may as well state that the whole of this side of the citadel has much suffered from the effects of denudation; that the action of frosts and rains have so disintegrated the rocks, that it has from time to time crumbled away and fallen into the ditches, and for the distance of some 70 yards or so, quite filled them up; the ramparts have likewise suffered, and are, in consequence of denudation, very low and weak on this side of the camp. On all the other sides, the terrace walks on the top of the ramparts vary from 40 feet to 20 feet in width, whereas on the western side they are under 6 feet, but gradually widen and become higher towards the north and south sides of the earthwork. There is very little doubt, that the western side was never so strongly fortified as the others, as there was less need of deep ditches on that side, on account of the natural steepness of that part of the hill, and the fact of its overlooking the country of the Silures, who were, in all probability, the people who defended the Beacon Camp against the enemy coming up from the plains of Worcestershire and Gloucestershire.

Tacitus informs us that the Silures were the most determined of all the tribes of Britain. He describes them as being of swarthy complexion, curled hair, of great ferocity and audacity; and, being of a warlike nature, gave the Romans much trouble.

They were finally subdued under Ostorius Scapula, A.D. 70—78, before which they abandoned their own country for that of the Ordovicians (the people of North Wales). They took post upon the ridges of some lofty mountains, where the sides were gently inclined and approachable; they piled up stones as a rampart.

It has been asserted by certain local archæologists, generally looked up to as authorities, that the reason for the weakness of the ramparts, and the breaches on the west side, is due to the camp having been stormed, and the ramparts thrown down.

Mr. Lines states that we find a much greater breach on the western vallum of Midsummer Hill, extending 600 feet, from which it is probable the two forts were dismantled at the same time and from the same quarter.

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This is, undoubtedly, another instance of the effects of denudation, the ditches being level with the tops of the rampart.

General Pitt Rivers, who is our best authority on British earthworks, examined the fortifications of the camp with me, and he was of opinion that the absence of the ramparts and ditches here, could never have been caused by the camp having been stormed from that point. Apart from this side looking over a friendly country, there is no better reason for the absence of the ramparts than that already deduced, *i.e.*, that the west side suffers most from the severe weather, and that the whole of the so-called breaches have been caused by denudation, which, I may add, still continues with great rapidity, and may be seen upon all the slopes on the western side of the Malverns.

The section made in this outer ditch was 12 feet long by 3 feet in breadth. At a depth of 3 feet, some black pottery and a sling stone were met with. In the course of the excavation of this trench, several large blocks of Laurentian rock (natural rock of the hill) were found at a depth of 6 feet from the surface; this was evidently the bottom of the ditch, as no evidence was discovered of its having been disturbed by man.

On the main way from the camp on the south-west side, there are several depressions or hollows visible on the sides of the way. In one of these an excavation was made, 7 feet long by 5½ feet wide, and 3 feet in depth, but it contained nothing.

19th September. A section was cut into the rampart, on the north side of the citadel, 4 feet wide by 22 feet long; this was from the inner side of the hollow or flat, up to the centre of the crest of the rampart.

Beneath the turf on the flat and the lower portion of the interior slope, the soil was very dark, in parts almost black. At 1 foot below the turf, a fragment of bone was thrown out, pieces of charcoal, and a quartz pebble; at 20 inches, bones. At 1½ feet, the thickness of the turf and surface soil, the old interior slope of the rampart became visible; it was composed of angular fragments of the rock, as thrown out of the ditches below. At a depth of 18 inches, resting upon this interior slope, and on the flat cutting at the same depth, bones and teeth of pig were found; at 2 feet, tusk and tooth of pig. At 2½ feet, in the middle of the rampart, several fragments of coarse black pottery, some having a rim, and bones of ox; at 3 feet, pottery; at 4 feet and 4½ feet, charcoal; at 5 feet, in the centre of the rampart, decayed bones and charcoal; at this level, was a hard seam composed of clay, burnt ashes, and charcoal; in it a quartz pebble was found. At 5½ feet, the old surface line of the hill was discovered; it was composed of a layer of bluish coloured clayey soil, having a most disagreeable smell, compared by the men to that of exploded gunpowder, about 3 to 4 inches in thickness; this was all tha remained of the original turf of the hill upon which the rampart was thrown up. In it fragments of charcoal were found. The excavation was continued to a depth of 7 feet 2 inches, but without further results being attained.

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20th September. A section 16 feet long by 4 four feet wide was made through the outer rampart on the south side of the camp facing the Thorn Tree. I was obliged to leave before it was completed, but General Pitt Rivers reported that the result was the finding of two pieces of pottery, the one hard and red, and the other soft and black, which was insufficient to prove anything.

In a ravine to the south-east of the Beacon Camp and a little below Clutter's Cave, against the roots of an old crab tree, lies a huge block of syenite. This stone is called the "Divination" Stone, and has been described in ancient manuscripts as the show stone, suggesting that at one time singular religious rites were performed upon it.

The exact dimensions of the stone I did not take, but simply measured the part that bore the appearance of having being hollowed out by man. The hollow portion of the stone faces south and is 4 feet wide from east to west, and 3½ feet from north to south; the centre of the depression is 4 inches in depth.

A little beyond is a British trackway still visible in places, leading from the top of the hill to an old spring called "Waums" Well.

A ditch extends all along the top of the Malvern Range, which is said to have been constructed by Gilbert de Clare, the (red) Earl of Gloucester, who married Joan of Acre, daughter of Edward the Ist. The Earl resided at Hanley Castle and received the rights of Malvern Chase as his wife's dower, so, wishing to separate this from the lands of the Bishop of Hereford, he constructed a ditch. It is hardly possible that a ditch alone without a fence or palisading could keep deer and other game from straying. He swore his usual oath, "By the Splendour of God, if I catch any man trespassing upon my manor I will cut off his hands."

This ditch, which starts from the Worcestershire Beacon, is cut upon the Worcestershire side of the range, and is in some places very sharp and deep, notably on the high peak over Malvern Wells, where are also two large tumuli, the centres of which are broken in and measure respectively 12 and 10 feet in diameter across the hollow (they do not appear to have been opened). The dyke may be traced on to the Winds Point (before reaching which, not far from the pig-path, on a level side of the hill, is another tumulus), it then apparently makes use of the outer ditch of the Beacon camp past the place of assembly, and at the south end goes off at right angles above the valley by the Thorn Tree, keeping along the top of the hills, crosses the Silurian Pass (where many old British roads or trackways may be clearly traced, the principal of which runs into the Ridgway) over the Swinyard Hill up the side of Midsummer and Hollybush Hills, through the north side of the ditch of Hollybush Camp, down the declivity on the south out of the Camp, over the Hollybush Pass, and top of Ragged Stone Hill.

This dyke or ditch must be of greater antiquity than that usually assigned to it, and I am inclined to think that it was originally formed by the Silures, or by whatever tribe held these hills as a line of defence and covered way from one end to

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the other; from which they could keep a command over the plains of Worcestershire and Gloucestershire. I am of opinion that it was formed subsequently to the camps, as the outer ditches on the eastern side of both have been made to do duty for a portion of it.

It is very natural to suppose that the Earl of Gloucester adopted it as his boundary, but hardly credible that he should have had it dug out for the purposes assigned.

When the Ordnance Surveyors were excavating in 1849 upon the summit of the Worcestershire Beacon, a small urn of Saxon Pottery was discovered, containing charred human bones; this urn is in the possession of Mr. E. Lees, of Worcester. As another instance of Celtic occupation of these hills, I may mention that in the year 1650 a gold crown or coronet was discovered by a poor man whilst making a ditch in the parish of Colwall, which is situate at the base of the Herefordshire Beacon. It has been mentioned by Camden and others. An old MS., said to be in the possession of Jesus College, Oxford, states that a coronet or bracelet of gold, set with precious stones, of the size to be drawn over the arm and sleeve, was found at Burstner's Cross. It was sold to a goldsmith in Gloucester for £37, who sold it to a jeweller in Lombard Street for £250, and he again sold the stones alone for £1,500. Thus we must imagine the gold crown was melted down.

There are many traditions of coins of remarkable value having been found, but no one can say to what period they belonged.

Before closing this paper, I may mention that having carefully weighed all the evidence, we may consider this large camp, as well as the other camps on Hollybush and Midsummer Hills, to be of late Cymric or Celtic origin, and that the latter camp is of earlier date than that on the Herefordshire Beacon, and that in all probability they were occupied for a time by the Romano-British, as many remains of those people exist in the county, and the pottery appears to be of that period.

I hope at a future time to be able to make another section right through the ramparts of the citadel and of the camp, with a view of clearing up more conclusively the age of the castrametation.

Discussion.

Mr. Vaux remarked that he was intimately acquainted with the topography of the Malvern hills, and could therefore bear testimony to the accuracy of the outline plans exhibited.

General Pitt Rivers said that although he had accepted Mr. Price's invitation to join him during his examination of Herefordshire Beacon, he had occupied himself entirely with the plan of the camp, and therefore could not speak as to the position of the relics discovered; but, from Mr. Price's account of the diggings, he concurred with him in thinking the results as to date doubtful; the absence of glaze on any of the pottery was certainly a circumstance to be noted in favour of a Celtic origin. But, on the other hand, some if not most of the pits

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contained objects of later date, and the examination of the rampart is scarcely sufficient to base any conlusion upon. He quite concurred with the author of the paper as to the long mounds not being barrows; he felt satisfied that if Mr. Price's explanation of them tallied with his own, they were artificial rabbit burrows; the supposed breach on the west side was clearly produced by natural causes. We had yet to determine to what extent, if at all, keeps or citadels in the interior of works were in use in pre-Roman times. Double and treble lines of defence were undoubtedly common. The scientific exploration of these camps is only commencing, and we were as yet without sufficient data for generalisation.

BRONSIL CASTLE, EASTNOR.

[Read by G. H. Piper, Esq,, F.G.S., at a joint meeting of the Malvern and Woolhope Clubs, on the 20th May, 1880.]

At various times the name of this place has been spelled Bronsill, Bransill, Brantsill, Bramstill, Bromeshill, and in other ways.

Several derivations are suggested for the name. It may have originated from the Kymric word "Bryn," a hill, the Saxon synonym having been subsequently added, but this, though of frequent occurrence, is here improbable. The common broom *(Cytisus Scoparius* or *Planta Genista)* grows in the neighbourhood, and may have left its name here. In the Ordnance Map it is spelled "Bransill," which may have come from "bryn," or from the name of the early British christian, Bran; but, unfortunately, the orthography of the Ordnance Survey is not reliable, and the place is not called "Bransill" by the people. A derivation more probable than any of these is the Kymric word "Bron," a breast; a rounded hill, "The Bron," may well be supposed to have been the early name of that which is now called Midsummer Hill, under the shadow of which the castle nestles. A station too conspicuous and important to have remained unnamed by its original possessors, who certainly did not call it Midsummer Hill. The Old English suffix "hyl," a hill, being added to the primitive "Bron," would naturally become softened into "Bronsill," which name passed phonetically from generation to generation of the old inhabitants, and is still in use.

Bronsil Castle, formerly a baronial residence, in the parish of Eastnor, on the eastern side of the county of Hereford, is certainly the most modern of the castles of the middle ages within the county, and partook less of the character of a fortress than a defensible place, or castellated mansion. The ruins are near the western base of Midsummer Hill, an imposing and highly interesting feature of the Malvern range, crowned by earthworks of great antiquity and extent, protecting the once important British settlement on its own slopes, and on those of Hollybush Hill, distinct traces whereof may yet be found; and dominating the Gullet and Hollybush passes. The castle, now represented by the present ruin, was erected upon

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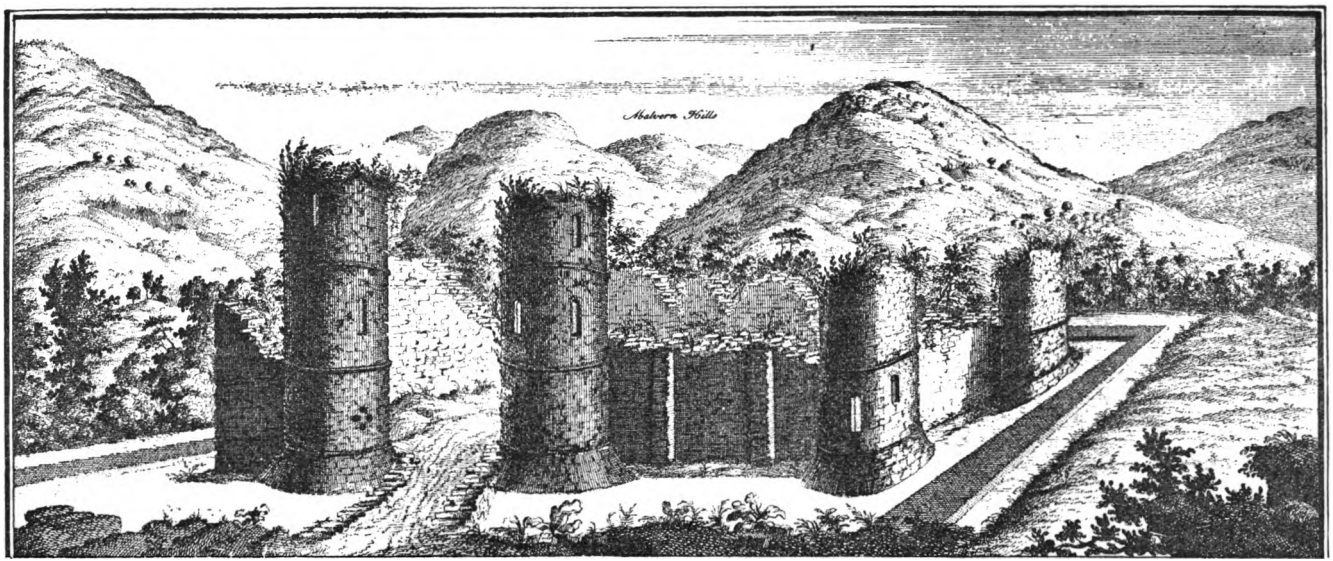
The south-west view of BRANSTILL CASTLE, *in the county of Hereford.*



THIS CASTLE stands in a solitary Place at the Foot of the west side of Malvern Hills. It's a quadrangular Oblong and encompass'd by a Double Ditch of the same form as is here represented; and appears by several circumstances in the Remains themselves, as well as by other concurring Tokens to be a Place of very great Antiquity: tho' we shall not pretend to determine that it is Roman. There is very lately discover'd in it, a Cavern which is not yet open'd,—Thos. Rede, Esq., is the present Proprietor thereof.

S. & N. Buck delin et Sculpt. 1731.

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the site of a building of much greater antiquity, by Richard Beauchamp, Esquire, the son and heir of John, first Lord Beauchamp, of Powyk, to whom license was granted in 1449, and again in 1460, to enclose 300 acres of land in Eastnor, as a park, and to crenellate his mansion (Lic. Crenell. Rot. Turr., 29 and 36 H. VI.). The building was probably completed in the reign of Edward IV., and Buck's view taken in 1731, at a time when the towers and most of the outer walls were standing, although in a state of ruin; and another drawing made by Kennion, some forty years later, possess details sufficient for a correct estimate to be formed of the size and appearance of the original structure. In form, it was nearly quadrangular; the sides measuring about forty yards in length, with a somewhat lofty octagonal tower at each angle. Of these a portion only of one remains standing. The old prints convey the erroneous idea that the towers were circular, but this is set right by Robinson's view taken in 1869. The approach was by means of a draw-bridge on the western side, with a doorway flanked by towers; and the whole was defended by two moats, some twenty yards apart. The greater part of the inner moat, which was faced with stone, is still well preserved, and the form of the outer moat may be easily traced—double moats like these are rare and curious. It is said that a place within the building was formerly used as a dungeon, and in *A Description of England and Wales*, published in 1769, occurs this passage: "There has lately been discovered in it a very remarkable cavern."

The Reedes continued to occupy Bronsil until it was burnt and desolated in the civil wars of the seventeenth century, but how or when I have not been able to learn. Webb mentions that Richard Reede, with Robert Higgens, of Eastnor, and Ambrose Elton, of the Hazel, Francis Hall, of Ledbury, and Sir Richard Hopton, of Canon Frome, associated with the rebels, and were named amongst the commissioners appointed for levying monthly exactions in the county, for sequestrating the estates of the Royalists, and other parliamentary affairs.—*Memorials of the Civil Wars*, page 25.

Sir John Beauchamp, one of the early proprietors of the castle, was much celebrated for his wisdom and courage. He was elevated to the peerage in 1447, by Henry VI., in consequence of many good and acceptable services performed by him to that monarch, and to his father, Henry V. He was Justice of South Wales, a Knight of the Garter, and afterwards Lord Treasurer of England. He bequeathed his body to sepulture in the church of the Dominican friars, in Worcester, in a new chapel "to be built on the north side for that purpose." His son dying without issue (male), the title, at the death of Richard, second Lord Beauchamp, in 1496, became extinct, and his estates were divided among his grand-daughters, of whom Margaret, the youngest, married William Reede, Esquire, of Lugwardine, Herefordshire,* son of Gabriel Reede, of Bronsil Castle, and Milborough Clynton, of Castle Ditch, Eastnor,† but descended from an old Worcestershire

* William Reed, son of Gabriel Reed, of Bronsil Castle and Milborough Clynton, purchased the Manor of Lugwardine from the heir of Sir Roger Bodenham, temp. Eliz.

† By the will (of which the writer has a copy) of "Thomas Clynton, of Estnor, in the "Countie of Hereford, Esquier, made the fourthe daye of December, in the Eyghteneth yeare

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family; in whose heirs Bronsil continued until the middle of the eighteenth century, when it was purchased by Mr. Cocks, of Castle Ditch, an ancestor of the present Lord Somers. A singular anecdote, illustrating the superstition of the period, was preserved in the Reede family. Towards the end of the reign of Queen Elizabeth, or very early in that of James I., Bronsil was disturbed by the visits of some restless spirit, whose nocturnal perambulations effectually banished every attempt at sleep from the eyes of the troubled inmates. Mr. Gabriel Reede, the proprietor, was advised to represent his case to Master Allen, of Gloucester Hall, in Oxford, who, according to Anthony a' Wood, was "the father of all learning and virtuous industry."—Coningsby's M.S. Not unknown in Herefordshire, where, probably, others besides the servants at Holme Lacy considered the watch that he carried to be his familiar spirit. [See anecdote in "Letters from the Bodleian Library," 1813.] To the University Mr. Reede repaired, and, on communicating to the learned Wizard the purpose of his visit, was desired to procure "a bone of the first Lord Beauchamp," as the only effectual means of silencing the unearthly disturbance; being assured that as long as the relic of its former celebrated proprietor remained within the walls, the castle would be free from any repetition of this spiritual infliction. Bones were procured and taken to Bronsil, which ever afterwards remained in peace. These wonder-working bones, portions of the vertebræ, were long regarded as heir-looms in the Reede family, and escaped the destruction in which the contents of the castle were involved when it was burnt. Mr. Reede removed to his seat at New Court, in the parish of Lugwardine, and thither the cedar box containing Lord Beauchamp's bones was carefully conveyed. New Court has, within the last hundred years, repeatedly changed masters, and it is not therefore surprising that this interesting proof of the credulity of the seventeenth century should have been lost from a want of information respecting its historical value, but the box labelled "Lord Beauchamp's bones," was carefully preserved during many generations, and in existence subsequent to the accession of King George III. Although so much of the castle was standing in 1731, the hand of the spoiler had been there before Kennion's visit in 1779, for he states that one tower alone was then left, probably the other portions had been despoiled to furnish materials for the erection of the dwelling-house and outbuildings now standing hard by, and an interesting memorial of the past was sacrificed to the demon of greed, or bad taste, or both, as the desolate ruin painfully attests.

To this very brief historical account may be added the following traditions, which were lately preserved among the elderly people of Eastnor. One of the Beauchamps, Lord of Bronsil, died in Italy, and could never rest until his bones were delivered to the right heir of the castle; accordingly, they were sent from

"of the raigne of o'r Soueraigne Layde Elizabeth by the grace of God quene of Englande, "France, and Irelande, defendor of the faythe, &c." Amongst very many bequests, a majority of them being curiously insignificant in value, the Testator gave as follows: "Item—I gyve to "my sonne in lawe Gabriell Reed my seconde beste silver salte." "Item—I gyve to my sonne in "lawe Gabriell Reed the one halfe likewise of all the debte that he shall owe me at the tyme of "my decease." The will was proved in the Prerogative Court of Canterbury, 19th May, 1576.

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Italy enclosed in a box, and were, after the demolition of the castle, long in the possession of the Reede's, and afterwards of Mr. Sheldon, of Abberton, in Worcestershire. Another tradition is, that a raven, presumed to be an infernal spirit, sits over the moat to guard a chest of money, buried within the island whereon the castle stands, which treasure must remain there until discovered by the rightful owner, but that even he cannot attain it unless he possesses the bones of the old Baron. About the year 1840 the moat was partly cleaned out by the late Mr. Watson, of Bronsil. I was told by Thomas Cale, of Ledbury, stonemason, who helped at the work, that some weapons, and many other things were found, particularly buckles of great size, oddly shaped spoons, &c. In the bottom of the moat were many large, rounded stones. This I can readily believe, as the trap bosses in close contiguity to the castle afford a multitude of "greenstones" of various sizes, from grape-shot upwards—some intensely hard—and it is quite probable when the moat was first excavated a trap dyke was cut into. He also said there was a dungeon within the ruins, but he did not go down into it. Prior to the reign of Her present Majesty might be seen in some of the cottages small cannon balls picked up in the neighbourhood, which the people called "Oliver's Pills." Castle Ditch was taken in 1644 by a small body of Roundheads, under a younger son of Sir Richard Hopton, after some firing and a brief show of resistance by Mr. Thomas Cocks, and it is probable these missiles were employed at that period. The Rev. Edward Higgins was told by the late Earl Somers that many leaden bullets were found imbedded in the old oak doors of the ancient mansion, which was taken down when Eastnor Castle was built, towards the end of the first decade of the present century. Hopton's triumph over his neighbour was of very short duration, for after a few days possession, a party from Hereford invested the house, to whom, in less than four and twenty hours, he was obliged to surrender, and, with 40 foot and 20 horse, was carried prisoner to that city, before Massey could send aid from Gloucester. Doubtless field pieces were used on this occasion.

The following entries relating to the Reedes of Bronsil, occur in the parish register of Eastnor :—

1596, December 20.—Gabriel, sonne of Richard Reede, was baptised.

1603, November 20.—Milboro, daughter of Willm. Reede, was baptised.

1611, December 8.—Margt., daughter of Willm. and Sybill Reede, was baptised.

1613, December 4.—Gabriell Reede, Esq., buried.

1614, January 27.—Milboro, wife of Gabriel Reede, buried.

1614, February 19.—Richard, sonne of William and Sybill Reede, baptised.

1624, July 17.—Sybilla, wife of William Reede, died, and was buried at Much Cowarne.

1634, December 11.—William Reede died, and was buried at Lugwardine.

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Woolhope Naturalists' Field Club.

JUNE 22ND, 1880.

THE second Field Meeting of the year took place on Tuesday, the 22nd June. The object of the Meeting was to examine the Drift Beds of the Severn at Buildwas; the Wenlock Shale and Limestone of the Silurian system, as exhibited at Benthall Edge and the range of hills of which it forms a part; and lastly, on the kind invitation of Mr. George Maw, to visit the garden of Benthall Hall, which is so justly celebrated for its great botanical interest. The journey by way of Shrewsbury to Buildwas was long; the day before was so very wet, and the morning itself so cloudy, that the attendance was much smaller than was anticipated. The President, Mr. Knight, was unavoidably absent, and his place was supplied by Mr. J. G. Morris, the senior Vice-President in the field, supported by Dr. Bull, Mr. W. A. Swinburne, the Revs. J. Tedman, S. Thackwell, J. E. Grasett, H. B. D. Marshall, and W. Bowell; Messrs. T. Curley, Henry Vevers, Jos. Carless, jun., T. C. Paris, James Davies, John Lambe, Charles Fortey, T. D. Burlton, and Theophilus Lane. At Craven Arms, they were joined by the Rev. J. D. La Touche, the energetic leader of the Caradoc Field Club, with the Misses La Touche (2), and Messrs. Levi and Ionides.

Mr. Maw met the Club at Buildwas station, and led the way to the pits of sand and gravel close at hand.

THE BUILDWAS DRIFT BEDS

are very well shown in section by the side of the railway. They consist of very fine sand and shingle in stratified layers, and in the immediate neighbourhood the whole beds present a very considerable thickness. A little below Buildwas, as Mr. Maw pointed out, the broad valley of the Severn contracts suddenly, and at the entrance of Coalbrook Dale the river breaks through great Silurian ranges near its termination, with the Wenlock limestone escarpment of Lincoln Hill on the east, and that of Benthall Edge on the west. These Drift Beds, from the regular manner in which they were deposited and from their great thickness, imply a very long period of submergence after the main features of the district had taken the existing contour. The Severn valley was here filled up by a stratified deposit of from 200 to 300 feet in thickness, and this deposit is now represented by the rounded hill, called Strethill, in full view, and whose summit is 280 feet above the river. The base and summit of this hill have these same clear water-worn sands and gravels in horizontal strata, with a depth of some 60 feet in the centre consisting of tough clay drift, almost unstratified, and containing fragments

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of rocks and water-worn boulders in very irregular order. The great bulk of these deposits was probably carried off on the rising of the land, after its long submergence, when the river found its way through the great barrier formed by the hard ridge of limestone. Strethill is now the record of what the whole valley of the Severn was covered with before its denudation. The materials of this enormous mass of drift, Mr. Maw was convinced, were for the most part of local origin, but the occurrence of certain Lias and Chalk remains, Oolitic, and particularly of boulders and granite pebbles, prove that at least a portion of them had been transported some 120 miles from the north. Large blocks of Cumberland and Scotch granite occur thickly strewn at Bourton, beyond Wenlock, at a height of 800 feet above the sea level. These blocks could only have been brought by the agency of floating ice, and must have been deposited from icebergs stranded on these high hills, when the sea submerged nearly the whole of the west of England.

Mr. Maw has collected a large series of shells and fossils from the drift bed during the construction of the railway which passed through them. The shells amount to some forty varieties, though often in a very fragmentary state, *Cardium Edule*, *Tellina Balthica*, and particularly *Turitella terebra*, were the most perfect and frequent. All these shells are of recent species. The fossils were from the Silurian, Carboniferous, Diassic and Chalk formations; a few marine organisms, and occasionally some vegetable remains of oak or of yew trees. These shells and fossils were afterwards shown to the Club at Benthall Hall.

The members searched in vain for any shell fragments at this particular spot, and the way was soon taken up the steep hill of Wenlock Limestone, which is there called Benthall Edge. The woods were too wet to tempt the botanists present to leave the path, and the discussion still went on about the stratified deposits they had visited, and the very great length of time it must have required for their formation.

The Rev. J. La Touche, who had conducted for some six years a series of observations to ascertain the amount of detritus carried down by the river Onney, stated as the outcome of all his work, carried on with so much ability and perseverance, that he found it would require a period of 400 years to cause a single inch of denudation from the valley, whose floods and storms and rain waters this small river carries off.

On the summit of Benthall Edge, immediately above a quarry, which left an open and extensive view of the surrounding country, Mr. Maw gave a most interesting

DESCRIPTION OF MAIN GEOLOGICAL FEATURES OF THE DISTRICT,

aided by maps and sections, which he had kindly brought with him. This informal lecture was a model of what a "field address" should be—clear, precise, and practical, and in answer to the many questions put to him, Mr. Maw showed how closely he had studied the physical and geological character of the hills and valleys before him.

Benthall Hall was close at hand, but on the way there a cluster of *Agaricus Pholiota mutabilis* was gathered, and also a specimen of *Boletus elegans*, which

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of late years has become so much more frequent than it formerly was. It grows under the larch trees, and is often in such abundance as to colour the surface of the ground.

At Benthall the gardens were at once visited. Hardy plants are here arranged in their proper botanical classes, each with its own bed, separated by rockwork from its neighbours, and all very carefully labelled and named. To attempt to describe these families of plants would be to give a long catalogue of very hard names, for the garden is worthy of continued study; and it can only be properly appreciated by the botanist and true lover of plants in the wonderful variety that nature affords.

The family of the crocus is the only one to which allusion can be made here, since it is the one in which Mr. Maw is the great authority. Two years since, only 50 varieties of the crocus were known to exist in Europe. By Mr. Maw's energy and perseverance, 20 more have been since added to the list. Mr. Maw has himself made very beautiful drawings of each variety, with all the necessary botanical details, drawn to scale, and when published, the work will be one of great interest and value to science, as well as one of great intrinsic merit in itself.

The members of the club were then invited to luncheon, with a large circle of private friends who had assembled to meet them. Amongst those present were the Rev. G. Edmonds and Mrs. Edmonds, of Little Wenlock; Mr. George Burd, Mrs. and Miss Burd, of Ironbridge; the Rev. H. S. Wood, Mrs. and Miss Wood, of Coalbrookdale; Captain and Mrs. Wayne; the Rev. G. F. Lamb and Mrs. Lamb, of Broseley; the Rev. J. W. Ellis, of Wenlock; Mr. Lowndes, Miss Spearman, the Misses Thorn, and several others whose names did not transpire.

After luncheon the members of the Club wandered through the rooms of this picturesque and interesting mansion of the time of Henry VIII., whose handsome oak staircase, by the way, is figured in Nash's Mansions. The geologists examined the shells and fossils which have been already alluded to; the botanists revelled in the dried plants and drawings, so well prepared by Mr. Maw; and all once more took a parting glance at some special tribe of plants, or others in the botanical garden.

The time had now arrived to leave, and with grateful thanks for most kind and genial hospitality, the Club left for Wenlock under the guidance of the Rev. J. W. Ellis—a very pretty walk of three miles by an ancient road with many fine old yew trees scattered along it. The weather had hitherto been all that could be wished, but now a thunderstorm came on, and though it was at some distance, it rained too much to enable the yew trees to be measured, or even a fine *Polyporus sulfureus* to be gathered from the trunk of one of them in an adjoining field, though it showed its beautiful tints from carmine to yellow in the distance. Wenlock was thus reached with half an hour to spare, and this was very pleasantly spent in the beautiful ruins of the Abbey. The train conveyed the party safely home, and all felt that a very enjoyable day had been spent, and another red-letter of the Club had been added to the numerous list that has gone before.

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Woolhope Naturalists' Field Club.

JULY 27TH, 1880.

THE third field meeting (ladies' day) took place at Tintern, on Tuesday, the 27th July, when there was a large attendance of members and their friends. Amongst those present we observed—The President (Mr. J. H. Knight), Miss Rose, Mrs. Stevenson, Mr. Thomas Cam, Mrs. Norton (Watton Clevedon), Judge Herbert and Mrs. Herbert, Miss Wood, Mr. H. H. Wood, Mrs. H. H. Wood, Dr. Chapman, Rev. W. C. Fowle, Mrs. Fowle, Miss Herbert, Rev. C. Maddison Green, Mrs. Maddison Green, Rev. A. W. Horton (Dewsall), Mrs. Horton, Miss Bailey, Rev. W. Wyatt, Mrs. Wyatt, Rev. J. E. Grasett, Mrs. Thomson, Rev. G. M. Metcalfe, Mrs. Metcalfe, Mrs. Godby, Major Doughty, Miss H. Morris, Mr. H. C. Moore, the Rev. W. H. Gretton, Miss H. Gretton, Miss M. Gretton, Miss E. Gretton, Mr. T. J. Salwey, Miss May Vevers, Mrs. Bradney, Mr. J. A. Bradney, Miss Bradney, Miss Alice Bradney, Miss Kate Salwey, Miss C. Salwey, Rev. W. R. and Mrs. Shepherd, Mr. and Mrs. G. C. Haddon, Mrs. E. E. Edwards, Mr. A. G. Levason, Mrs. Levason, Mr. T. Lane, Mrs. Lane, Miss Perkins, Rev. W. Elliot, Mr. Gilbert Elliot, Mr. T. D. Burlton, Mr. T. Curley, Rev. E. J. Holloway, Rev. H. B. D. Marshall, Miss Matthews, and several others whose names we were unable to obtain.

The party travelled by Great Western Railway from Barrs Court Station at 9.45 arriving by special train at Tintern at 11.30, and proceeded direct to the abbey, where they were joined by Dr. Yeats (Chepstow), and Mr. J. Lorraine Baldwin (St. Anne's).

Dr. YEATS gave an oral explanation of some very curious stones found in the Abbey, one sometimes supposed to be a plan of the Abbey estates.

An explanatory paper was then read by Mr. Haddon (architect), giving a most interesting description of the Abbey itself, which Mr. Haddon illustrated by exhibiting some well-executed drawings and plans of the building. Owing to the difficulty of getting conveyances to convey the party to Trelleck to view the entomological collection of the Rev. C. A. Kupar, which he had kindly consented to allow the members of the Club to inspect, the programme was, in this instance, departed from, and many of the members and visitors then wended their way to the woods of Wyndcliff, and the interesting town of Chepstow. The day was beautifully fine, and the scenery from the heights of Wyndcliff was magnificent, and thoroughly enjoyed.

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By the courtesy and great kindness of Mr. Lorraine and Lady Frances Baldwin, some of the members and visitors were allowed to inspect their charming residence and gardens of St. Anne's, near to the Abbey. It contains such a collection of rare and interesting articles of vertu as is not easily to be found elsewhere, all arranged with most exquisite taste and judgment. The view of the Abbey ruins, and the woods in the rear, from the gardens, is most charming and beautiful; and, judging from the healthy-growing state of the many choice shrubs and flowers, the climate must be very mild and genial.

Punctual to the time fixed, those who had gone to the Wyndcliff returned to dine at the Beaufort Arms Hotel, where a most excellent dinner was provided by Host Garrett, of which the members and visitors (68 in number) partook with good appetites. After dinner, the usual toast of "The Queen" (the only one allowed by the rules of the Club) was given by the President, and loyally received.

Dr. YEATS then gave an excellent address on "The river Wye as a source of interest to Naturalists," and also on "The Cistercians, or Monks of Tinterne, as Naturalists, *i.e.*, as lovers of Nature and interpreters of Nature."

This very interesting address was exceedingly well received. It embraced some account of the salmon fisheries of the Wye; historical notice of the particular Foundation of Tintern; and a description of the economic value to the country of the Monasteries in general, from the attention given by the monks to the cultivation both of fields and gardens, the introduction by them of new varieties of plants and flowers, &c.

Dr. Yeats exhibited a model of a boat and fish-net, still used at Tintern, and possibly old enough in design to have served the Cistercian Fraternity.

As the address was extemporaneous, the following are no more than some brief notes taken from memory. Had it been possible to secure it verbatim, it would have been a valuable addition to The Transactions of the Club; and it is much to be desired that Dr. Yeats will some day kindly put his valuable and learned remarks into the shape of a paper for appearance in our Transactions.

THE RIVER WYE (Welsh, *Gwy*-Water).

THE River Wye is 148 miles long; it winds considerably, is turbid, is a tidal stream and descends probably 450 feet to the sea: (see Nature III. and IV., 1879).

The value of a salmon fishery depends on the extent of its breeding-grounds: the area of the Wye Catchment basin is computed at 1655 square miles, of which 775 are lost to the fish; only 880 are accessible and available for economic purposes. A great misfortune to the nation.

Seventeen rivers are mentioned on the statute of 1714,—the united area of their Catchment basin was 18,247 square miles, and there are now only 6,607 square miles left accessible for the fish; a large portion of which being nearer the mouths of rivers than at their upper waters, is not fitted for breeding purposes; there is, therefore, only about *one-third of the area left* that *formerly* existed.

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Salmon is a migratory being that can only be bred in the upper portion of a river; the fish feed in the sea, and if you exclude them from a river, or exclude them from the sea, they may soon become extinct.

The rivers of England and Wales exceed in extent those of either Scotland or Ireland, which supply large quantities of salmon, and yield a large revenue.

"A National property, which was in early times watched over by the legislature and encouraged, has through improvidence and neglect been suffered to decline."

It is worthy of remark that the salmon fisheries, both of Ireland and Scotland, though smaller in extent and not superior in natural capabilities to those of England and Wales, have each received much more care and attention in recent times, and are at the present moment far more productive: England is however moving.

Among the causes of decline are, chiefly, *spread of manufacturing industries*, barring and *polluting* our streams.

At Nanty, within 3 miles of the source of the Wye, there is a lead mine, and the injurious effects of its working are felt—as the Inspectors are told—as far down as Rhayader, about 14 miles below.

There is a curious relation between the English Cathedral cities and the salmon rivers. Out of twenty-seven bishops, eighteen preside over sees that produce or ought to produce salmon. Let the ladies be pleased to think of the Cathedral cities on the banks of the salmon-producing rivers; the Ouse, Wear, Exe, Elwy, Wye, Taff, Avon, Eden, Severn (two), Dee and Ure. Let them also try and name the Cathedral cities, lying on the banks of the rivers where salmon-produce has been destroyed, viz:—the Stour, Thames (two), Itchen, Avon, and Medway. Further, let them seek the Cathedral cities, on the banks of the rivers which never were, and never will be, salmon-producing rivers, either being too near the coast, or not in a mountainous part of the country.

The office seal of the Vicar of Whalley, near Clitheroe, Lancashire, is that of three salmon, with their tails interlocked; it resembles a monumental stone in the Abbey.

CISTERCIANS.

Named from Citeaux, wild forest, 15 miles from Dijon.

Order.—Off-shoot of Benedictines, and professing their rule "in its primitive vigour."

Founder.—St. Robert, native of Champagne, born 1018, joined Benedictines; afterwards (1075), left them for a company of hermits. Later on, the more zealous Bededictines of his former monastery (Molesme) went with him to *Citeaux*, and built wooden huts. Date of foundation—1098. Eventually (1100) Robert was forced to return to Molesme, and died there.

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Habit.—Originally "tawny," afterwards white.

Progress.—Rapid; in 1200 there were 1,800 abbeys. Military orders of Calatrava and Alcantara, and of Christ and Avis were subject to it.

The famous order of "La Trappe," the most austere order in the world ("Trappists") is a reform of the Cistercians (1664) by de Rancé.

Connection with England.—1. Stephen Harding, one of the first and most eminent companions and a successor of St. Robert, was an Englishman.

2. In the reign of Stephen, King of England, "noble and churl welcomed "the austere Cistercians, a reformed out-shoot of the Benedictine Order, as they "spread over the moors and forests of the north. A new spirit of devotion woke "the slumbers of the religious houses, and penetrated alike into the home of the "noble and the trader. London took its full share of the revival. The new im- "pulse changed its very aspect. In the midst of the City, Bishop Richard busied "himself with the vast Cathedral of St. Paul which Bishop Maurice had begun, "&c."—Green, *History of the English People.*

"The Cistercian Order, which possessed vast ranges of moorland in York- "shire, became famous as wool growers, and their wool had been seized for Richard "the First's ransom. The Florentine merchants were developing this trade by "their immense contracts; we find a single company of merchants contracting for "the produce of the Cistercian wool throughout the year."—*Op. cit.*, p. 324.

The formal business of the Club was then transacted. Four new members —Mr. Edward Caddick (Birmingham), Mr. Henry Andrews (Leominster), the Rev. R. Wyatt Warner (Almeley), and Mr. A. G. Levason (Hereford), were proposed. The following letter from Mr. R. Hogg, secretary to the Royal Horticultural Society, South Kensington, was then read, and ordered to be entered on the minutes:—

Royal Horticultural Society, South Kensington, S.W.,
9th July, 1880.

SIR,—I am instructed by the Council of the Royal Horticultural Society to thank the Woolhope Club for two parts of the "Herefordshire Pomona," which they have been so good as to present to the Library of this Society; and at the same time to say that they will be pleased to receive the subsequent parts as they appear.

The Council have given directions to Mr. Barron, the garden superintendent at Chiswick, to afford every facility the garden affords to enable the Woolhope Club to carry out the important work in which they are engaged.

I have the honour to be, Sir,
Your obedient servant,

H. G. Bull, Esq., M.D., Hereford. ROBERT HOGG, SECRETARY.

At the conclusion of this address, the President, on behalf of the Club, thanked Dr. Yeats most warmly for the ready and valuable assistance he had rendered to the Club during their visit to Tintern. This brought the proceedings of the day to a close—the day up to that time had been exceptionally fine, and there was a very general expression of opinion that the visit had been most successful and enjoyable, the arrangements made under the direction of Mr. Thorne, station master at Barrs Court, for the accommodation and comfort of the members

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and their friends being complete and satisfactory. This prosperous Club, now numbering upwards of 200 members, will hold its next field meeting at Church Stretton, on the 24th of August.

INTERESTING PAPER BY MR. GEORGE COWLEY HADDON.

THE following interesting paper was read by Mr. George Cowley Haddon, architect, at the Meeting of the Woolhope Naturalists' Field Club, held on July 27th.

The name of Tintern is understood to be derived from the Celtic words *din*, a fortress, and *teyrn*, a sovereign or chief, for it appears from history, as well as tradition, that a hermitage belonging to Theoderic or Tendric, King of Glamorgan, originally occupied the site of the present Abbey, and that the Royal hermit having resigned the throne to his son Maurice, led an eremetical life among the rocks and trees here. Tintern Abbey, dedicated to S. Mary, was founded in 1131 by Walter de Clare, the grandson of Walter Fitzosbert, Earl of Ew. The first endowment of this monastery, as well as later benefactions, to the seventh year of Henry III., 1223, in a charter of confirmation from Roger Bigod, Earl of Norfolk, in 1301, is set forth in Dugdale's Monasticon. Herein, says Tanner, were thirteen religious about the time of the dissolution, when the estates belonging to this monastery were rated at £256 11s. 6d. in the gross, and £192 1s. 4½d., per annum clear income. The site was granted in the 28th, Henry VIII., 1537, to Henry, Earl of Worcester, and it is still the property of his descendant, the Duke of Beaufort. The common seal of this monastery is appendant to an instrument dated in the 6th, Henry VIII., whereby the Abbot and Convent appoint Charles, Earl of Worcester, and Henry Somerset, Lord Herbert, his son and heir apparent, chief stewards of their manor of Acle, in Norfolk.

The subject of this seal, of which only a mutilated impression on red wax remains, was the Virgin Mary and child seated under an ornamented arch in a niche underneath, and Abbot with his crozier on his knees praying. Nearly the whole of the legend is gone.

A sister Abbey to this was also situated on the shore of Bannow Bay, in the barony of Shelburne, three miles N.E. of Duncannon Fort, in the county of Wexford, Ireland. William, Earl of Pembroke, being in great danger and peril at sea, made a vow to found an abbey in that place where he should first arrive in safety. The place was the bay in question. He accordingly performed his vow, dedicated his Abbey to the Virgin Mary, endorsed it, and settled a convent of Cistercian Monks or White Friars in it, whom he brought from Tintern, in Monmouthshire.

Archdale gives the particulars of the Earl of Pembroke's endowments of this house. The whole, however, was not completed in the Earl's lifetime, for Dugdale has given King John's charter, confirming the bequest of 30 carucates of land to this Abbey in the Earl's will.

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John Power was the last Abbot; he surrendered in the 31st, Henry VIII.

The Abbey itself is stated to have been rebuilt in 1447. It was granted, with all its lands and appurtenances, 27th August, 18 Eliz., 1605, in capite to Anthony Collcough, at the annual rent of £26 4s., Irish money.

No other abbey in the kingdom has probably attracted half the attention that has been bestowed on Tintern. It is the most beautiful of all our Gothic monuments, and the situation is one of the most sequestered and delightful. One more abounding in that peculiar kind of scenery which excites the mingled sensations of content, religion, and enthusiasm, it is impossible to behold. Every arch infuses solemn energy, as it were, into inanimate nature, and it is altogether the most picturesque ruin of a monastic edifice with which we are acquainted.

It seems to have become a ruin rapidly. It was stripped of its lead during the wars of Charles I. and the Commonwealth (1650). For a century afterwards it was treated as a stone quarry, and Gilpin, writing in 1782, gives a frightful picture of the state to which the glorious pile had been subjected, and the utter misery of the neighbouring inhabitants, literally a population of beggars.

All writers are warm in praise of the exceeding beauty of the ruins of Tintern, less of the exterior however than the interior. Roscoe says, "Roofed only by the vault of heaven, paved only with the grass of earth, Tintern is probably now more impressive and truly beautiful than when with storied windows richly dight, for nature has claimed her share in its adornment, and what painter of glass, or weaver of tapestry, may be matched with her."

The singularly light and elegant eastern window, with its one tall mullion ramifying at the top and leaving the large open spaces beneath to admit the distant landscape, is one chief feature in Tintern. The western window is particularly rich in adornment, and those of the two transepts of like character, though less elevated.

Thus also writes Gilpin, "When we stood at one end of this awful piece of ruin, and surveyed the whole in one view, the elements of air and earth, its only covering and pavement, and the grand and venerable window in which it terminated, both perfect enough to form the perspective, yet broken enough to destroy the regularity, the eye was delighted above measure with the beauty, the greatness, and the novelty of the scene."

The Abbey is a cruciform structure, consisting of a nave, north and south aisles, transepts and choir. Its length from east to west is 228 feet, and from north to south at the transepts 150 feet.

The nave and choir are 37 feet in breadth, the height of the central arch 70 feet, of the smaller arches 30 feet, of the east window 64 feet, and the west window 42 feet. The total area originally enclosed by the Abbey walls is said to have been 34 acres. These walls may now be easily traced, and some of the dependent buildings are yet in a good state of preservation. In one of them the custodian of the Abbey lives. The four lofty arches which supported the tower

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spring high in the air, reduced to narrow rims of stone, yet still preserving their original form. The arches and pillars of the choir and transepts are complete. The shapes of all the windows may be still discerned, and the frame of the west window is in perfect preservation. The design of the tracery is extremely elegant, and when decorated with painted glass must have produced a fine effect. Critics who censure this window as too broad for its height do not consider that it was not intended for a particular object, but to harmonise with the general plan, and had the architect diminished the breadth in proportion to the height the general effect of the perspective would have been considerably lessened. The general form of the east window is entire, but the frame is much dilapidated. It occupies the whole breadth of the choir, and is divided into two large and equal compartments by a slender shaft, of not less than 50 feet in height, which has the appearance of singular lightness, and in particular points of view seems suspended in the air.

The style of architecture is early (English) geometrical. Decorated conventual examples of this particular period are to be found at Lanercost in Cumberland; Rivaulx, Yorkshire; Westminster Abbey; at Fountains, the choir and east end; Netley, Hampshire; Whitley, in Yorkshire; Valle Crucis, in Denbighshire; Ripon Minster, and the south transept of Beverley Minster, in Yorkshire; Milton Abbey, Dorsetshire; part of the nave of St. Alban's, Tynemouth; and Brinkbourne, Northumberland; Vale Royal, in Cheshire; and the eastern facade of Howden, in Yorkshire.

The stone used for the buildings is the red and grey sandstone obtained in the vicinity, in part laminated, its component parts being fine and coarse quartz, and other siliceous grains with argillo-siliceous cement, ferruginous spots, and plates of mica, in unequal, but, for the most part, in perfect condition, covered with grey and green lichen.

One of the most beautiful, and by no means the least interesting parts of the ruin is "the hospitium," or guest hall. It was a finely-proportioned apartment, measuring 85 feet long, by 28 feet broad, with a vaulted stone roof, supported on pillars, of one of which the massive bases yet remain. Here the monks dispensed their hospitality to their wandering brethren and to travellers. Tintern was celebrated among the Monasteries of England for good living and lavish hospitality.

The refectory is about the same length as the hospitium, but six feet broader, and has in the centre of the west side a groined and vaulted niche, about three feet above the surface of the apartment, which (probably) served the purpose of a lectern, whence pious lessons were read to the monks whilst at dinner. The buttery hatch is complete, as also a flight of steps in the north transept by which the Church was connected with the domestic portions of the Abbey. Traces of a chapter-house, and cloister, and dormitory also exist.

Among other sepulchral figures, is the mutilated effigy of a man in a coat of mail, with his shield on his left arm, which is erroneously supposed to represent

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Richard Strongbow, Earl of Pembroke, and great nephew of Walter de Clare (founder of the Abbey), who, according to Leland, was buried in the Chapter House of Gloucester. According to Grose, his right hand has five fingers and a thumb.

The number of monasteries, first and last, suppressed in England and Wales, were 645. Of these monasteries, 101—75 monasteries and 26 convents—were of the Cistercian Order, many of them pre-eminent for the beauty and retirement of their situation and the splendour of their architecture, particularly Byland, Kirkstall, Fountains (Yorks.) Furness, Whalley (Lan.), Buildwas (Salop), Tintern (Mon.), Netley (Hants.), &c., &c.

All the Cistercian churches were upon a large scale. Pontigny was 351 feet with transepts 162 feet; Fountains, in Yorkshire, 358 feet, with transepts 186 feet; Furness, 304 feet; Rivaulx, 222 feet by 50 feet; Netley, 200 feet by 60 feet in width. One reason given by Mr. Pugin for these vast dimensions, is the total separation of seculars from the community. But no doubt another important reason would be the sublime effect which is given to music by the lofty nave and majestic proportions of an ecclesiastical edifice erected in the style of our early English architecture. The Cistercian abbeys were celebrated for the grandeur of their divine music, which resounded in their churches night and day. The Offices were celebrated in them with so much solemnity and devotion that it seemed as if one heard there the voice of angels.

Early in the year 1098, a little band of Benedictine monks, 21 in number, including the Abbot, Prior, and sub-Prior, were seen issuing from the Abbey gateway of Molesme, in the diocese of Langres, in France, with no other provision for their travels, than the vestments and sacred vessels for the celebration of the most Holy Mysteries, and a large breviary for the due performance of the divine office, their departure having been occasioned through being at variance with the strict rule of their holy founder St. Benedict, and in defiance of the wishes of their pious abbot, and the remonstrances of his fervent disciple, St. Stephen, who was surnamed Harding, and was a Saxon born in England before the Norman conquest. The band of fervent brethren proceeded on their march in bold and solemn procession, deaf to the entreaty of those from whom they parted. Through wild and rugged paths they journeyed on, chanting the divine praises until they arrived at the forest of Citeaux, in the diocese of Châlons, in the province of Burgundy. Here they beheld a vast solitude, chiefly inhabited by wild beasts that found shelter in the thickets of underwood and brambles which luxuriated in the parts left vacant by forest trees. Through it ran a small stream, which took its rise from a fountain about five leagues (three miles one league), or 15 miles from Dijon, called Sans-fonds, because it was so deep that no one had ever found the bottom. The stream from this fountain sometimes overflowed its banks, and left in the hollows of the adjacent lands stagnant pools, which fostered the growth of bulrushes and various aquatic plants. From the features of its locality it derived its name of Citeaux.

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The beautiful and picturesque situation of many ancient abbeys arrests the traveller's attention and fills him with admiration. The quiet spot embosomed amidst green hills or the darker shades of the aged forest, and enriched by a more luxuriant vegetation than the surrounding country, with the "trotting brook" or the large rivulet, sweetly murmuring as it glides past the ruined walls, mantled by the friendly and ever-verdant ivy, might have once presented to the holy brotherhood, who selected it for their dwelling-place, the dreary and sterile aspect of Citeaux.

The Lord of Beaune gave the pious monks leave to take possession of this most unpromising property. They then hastily put together the trunks of trees which they had felled, and constructed in this very simple and primitive manner their new monastery. The rudeness of their dwelling gained for them a powerful friend.

Odo, duke of Burgundy, hearing from the Archbishop of Lyons that a number of holy men were building a monastery in his territory, made many enquiries concerning them, and when he found their habitation consisting of a few cells composed of unshapen timber so miserable that he feared they would not survive the hardships of this dreary and unproductive situation, he sent workmen to assist them in completing their monastery, furnished them for a long time with necessary provisions and gave them much additional land, and also cattle to stock it. When the edifice was ready for reception they appointed the 21st March, which in the year 1098 fell on Palm Sunday, for the solemn inauguration of the new Abbey.

But it is to the fame of St. Bernard, who joined in A.D. 1113, that the speedy and widespread popularity of the new order is to be attributed. The order was introduced into England at Waverley, in Sussex, in A.D. 1128, 29th of Henry I., the remains of the celebrated Waverley Abbey are situated about two miles south-east of Farnham, on the borders of Moor Park, still interesting from the associations connected with them, although the fragments are in this instance but slender.

They stand on a broad green meadow, round which the river Wey, overlooked by low wooded hills, winds on three sides, thus completely forming one of those valleys which the followers of the "pious Bernardus" are said to have preferred to the rocky heights loved of their Benedictine brothers.

The Cistercians professed to observe the rule of St. Benedict with rigid exactness, only that some of the hours which were devoted by the Benedictines to reading and study, the Cistercians devoted to manual labour. They affected a severe simplicity. Their houses were simple, with no lofty towers, no carvings, or representations of saints, except the crucifix. The furniture and ornaments of their establishments, were in keeping—chasubles of fustian, candlesticks of iron, napkins of coarse cloth, the cross of wood, and only the chalice of precious metal. The amount of manual labour prevented the Cistercians from becoming a learned order, though they did produce a few men distinguished in literature. They were excellent farmers and horticulturists, and are said, in early times, to have almost

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monopolised the wool trade of the kingdom. They changed the colour of the Benedictine habit, wearing a white gown and a hood over a white cassock. The reason assigned for the change of the habit is the devotion of St. Mary, observable in the order from the beginning. It was a standing law that all Cistercian monasteries should be founded and dedicated to the memory of the Queen of heaven and earth—Holy Mary. The immediate cause of the adoption of the white habit is mysterious. It seems difficult to account how it should all at once appear without the sanction of any statute of the order, especially as it was opposed to the custom, if not to the rule, of the primitive Benedictines. A tradition is even current in the order that Alberic saw the Blessed Virgin in a vision putting upon his shoulders the white garment, and that he changed the tawny colour of St. Mary Magdalene to the joyful colour sacred to the Mother of our Lord, in consequence of the consolation which the vision afforded him in the difficulties with which he was then struggling. The vision has not much historical authority, though the tradition of the Order and the strange circumstance of the change of colour itself are in favour of its truth. The one thing certain is that it was assumed in honour of the spotless purity of St. Mary, the special patroness of the Cistercians; and the circumstance that she was chosen to be the peculiar saint of the rising Order, is in itself characteristic. The black monks reproached the Cistercians with wearing a garment fit only for a time of joy, whilst the monastic state was one of penitence. But the white monks answered that the life of a monk was not only one of penitence, but was like that of the angels, and therefore they wore white garments to show the spiritual joy of their hearts. And notwithstanding their coarse bread and hard beds, there was a cheerfulness about the Cistercians, which may, in a great measure, be traced to what we should now call a sympathy with nature. When they went beyond the walls of the monastery they also wore a black cloak, as monks were to be their own millers and bakers, farmers, and gardeners, and doubtless such strict observers of the rule as the brethren of Citeaux. While their bodies were bent in agricultural labours their souls were raised to heaven. Again they had an expedient by which they were enabled to remain within a short distance of the cloister, however scattered their farms might be, and lose no time in journeying to and from the place of their labour, and they could always return to the duties of the choir and be within the monastery at the times set apart for meditation. Amongst a great number of monks many were lay brothers, who could neither read nor write, and had not faculties for learning the choir services. It was natural that these should be employed in the many menial offices which a large monastery would require. Hence arose the institution of lay brethren. It, however, appears to have taken its most systematic shape at the very beginning of the Cistercian Order. Some of them dwelt in the Abbey itself; others in the scattered and lonely granges around it. They kept the flocks and the herds of the community, and worked as shoemakers, tailors, and blacksmiths. Those who were in the granges were excused from the fasts of the Order, except in Advent and on the Fridays from the 14th of September to Lent. Whenever the bell of the abbey rang for a canonical hour they fell on their knees, and in heart joined the brethren who sang the office in the Abbey church. There were thus in every Cistercian

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Abbey "two monasteries—one of the lay brethren, another of the clerics." The choir brethren were thus enabled always to work within a short distance of the Abbey, and were strictly forbidden to remain a whole night in any of the granges without pressing necessity. The relations between the choir and lay brethren were of the closest kind. Instead of being treated as slaves, as they were by their feudal lords, these poor children of the soil and artizans were looked upon as brothers, and were by special law of the Order to partake in all spiritual advantages as though they were in-monks, which in fact they were in all but the name, for they made their vows in presence of the Abbot like other brethren.

Then followed a description of the building generally, as it is set forth in detail by Mr. Thomas Blashill, of London, architect, in a guide book he has published.*

Mr. Haddon is indebted to the Very Rev. Prior Raynal, of St. Michael's Priory, Clehonger, for the above "History of the Cistercian Order," by a Cistercian Monk.

*For Mr. Blashill's valuable paper on "Monastic Buildings," read at Tintern, on August 21st, 1877, see pages 4 to 11 of this volume.

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Woolhope Naturalists' Field Club.

AUGUST 24TH, 1880.

THE fourth field meeting was held on Tuesday, at Church Stretton, in Shropshire. A small party assembled at the railway station, and, on arrival at Church Stretton, were met by the Rev. W. Elliot, the Secretary of the Caradoc Field Club, who conducted them to the summit of the Longmynd Hill, taking the way through the hamlet of Little Stretton, and along the Ashes Valley. Close to Little Stretton, a quarry of Upper Llandovery rock, resting on the flank of the Cambrian of the Longmynd, and containing a few of the more characteristic fossils—*Pentamerus oblongus*, *Petraia*, and *Atrypa*—was pointed out; and on the way up the valley, in exposures of the Cambrian rock, several specimens of worm-tracks *(Arenicolites)*, together with the marks of rain-drops and wave ripples, were found. Until the discovery of the *Eozoon Canadense* in the Laurentian series of North America, these worm-tracks and burrows represented the earliest indications of animal life afforded by the records of the rocks.

Some wonder was expressed at finding, in such a peaceful spot, the hint of "war's alarms," in the shape of numbers of round shot scattered along the bottom of the valley and the bed of the little stream along which the path lay. They find their way there from the guns of the Volunteer Artillery, whose targets are placed on the side of one of the enclosing hills.

A few years ago, when the Royal Artillery came to Stretton for their annual practice, a shell, unduly elevated, passed over the top of the hill, and fell into the hamlet of Minton, causing some damage to a barn, and a considerably greater degree of not unnatural fright. The incident went "the round of the papers" for some little time after, under the sensational heading of "Bombardment of a Shropshire Village."

At the pole (1,674 feet above sea level) which marks the highest point of the wide heath-clad range, it was found that the thoughtful kindness of the President (J. H. Knight, Esq.) had directed certain well-stored baskets, sent from the hotel, to meet the party, and a profitable half hour was spent in discussing their contents.

From this spot, on a clear day (and the present was a very fair specimen), a magnificent panoramic view is displayed, from the Sugar Loaf and the Monmouthshire hills on the south, across the plain of Shrewsbury to the Cheshire hills on the north; from the Malverns on the east, over the hilly country of

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Montgomeryshire, even to the far distant peaks of Snowdon, Cader Idris, and Plinlimmon. A brief description of such geological features as came more nearly within the field of vision, succeeded the serious business of luncheon.

Turning to the westward, the eye is struck by the rugged outline of the Stiperstones, caused by large masses of quartzose grit that stand out from the Arenig (or, as they have more recently been pronounced, Tremadoc) shales of which the hill is composed. These form the base of the Lower Silurian system of which the Caradoc, or Bala, are the highest beds. Lying on the Stiperstones rocks, still towards the west, are the strata of the Llandeilo formation, rising boldly out of which is volcanic mass of Corndon. To the north-west, and beyond the high ground of Upper Ludlow, which is known as the Long Mountain, another igneous rock, the Breidden, is seen, the geologic outpost of England on this Welsh border. Southward, the great Ludlow formation spreads itself, to be seen in the line of Bringewood Chase and the wooded neighbourhood of the town from which it takes its name; while to the south-west, this same formation in Clun forest is capped by outliers of Old Red Sandstone. Looking now eastward, we find a series of rocks thrown off, dipping in opposite directions to those of the western beds, from the Longmynd as their axis. Just across the valley, through which the railway runs, and in which the little town nestles, the pre-Cambrian hills of Ragleth and Caer Caradoc form part of a line of the same age, which is extended by the Lawley to the Wrekin: and behind these lie, in regular succession, and at decreasing inclinations, the members of the Silurian family—Caradoc, Llandovery, Wenlock, and Ludlow, till they dip under the Old Red of Corve Dale. Out of this are seen to rise, bounding the nearer view, the Brown and Titterstone Clee Hills. These are formed of mountain limestone and millstone grit; evidence of the cause of their upheaval being found in the basaltic crags at their summits, overlaid with the coal measures. In parallel lines with the Caradoc and Lawley, three ridges mark where the harder constituents of the rocks composing them have resisted the action of denudation. The first of these denotes the presence of a very thin band of Woolhope limestone, resting on the May Hill sandstones. Then, more conspicuously, the great limestone reef of Wenlock Edge; and, beyond the narrow valley of Apedale, which succeeds it, thin bands of Aymestry limestone show the highest point of the Ludlow, from which the ground slopes down into Corve Dale.

The coal measures meet the Longmynd Hill on its northern extremity, followed by some patches of Permian, on one of which the town of Shrewsbury is built, and beyond these, stretch beds of the upper New Red Sandstone, which form the plain of North Shropshire and Cheshire. The rising ground a little to the east of Shrewsbury, is Haughmond Hill, a separated portion of the Cambrian strata of the Longmynd; and to the north of the town, a scarped eminence marks the well known New Red quarries of Grinshill.

Numbers of poor people, in groups, were scattered over the hill, gathering the Bilberry or Whortleberry (*Vaccinium myrtillus*), which they send or take to

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the market at Shrewsbury, and sell. These berries are black or purple in colour. They are also called, in Shropshire, "whimberries," and in the North and in Scotland, "blaeberries," or "blueberries." The berries of the Cowberry *(Vaccinium Vitis Idæa)* and of the Cranberry *(Vaccinium Oxycoccos)* are both red.

The descent from the hill was made by the Light Spout Waterfall, and by the Carding Mill valley, and after a very agreeable ramble amongst the paths and rocks, where some wild plants and ferns were collected, the party assembled at Church Stretton Hotel for dinner, under the presidency of Mr. Evan Pateshall, acting in the absence of Mr. J. H. Knight.

After dinner, the following paper, by Mr. Curley, was read (in his absence) by Mr. James Davies.

EXTINCT ANIMALS AND BRITISH FOSSIL OXEN DISCOVERED IN HEREFORDSHIRE.

[By Mr. T. Curley, C.E., F.G.S.—Read August 24th, 1880.]

In excavating for the arterial drainage of the Berrington estate, about half a mile north of Leominster, I found in the alluvium, about five feet below the surface, the skull of the Bos longifrons, and in the river gravel below this alluvium was found the horn of the red deer *(Cephas elephas)*, now almost extinct in Great Britain.

These fossils I have presented to the Hereford Museum, and they are now to be seen there. I also found in the ballast pit, about half a mile south of Dinmore station, the tooth of the woolley-haired rhinoceros *(Rhinoceros tichorinus)* in river gravel, and it appeared to have been rolled with the gravel in which it was deposited.

Numerous remains of extinct animals have been discovered by my friend, the Rev. W. Symonds, F.G.S., in the caves of Doward, a notice of which appeared in the scientific journals at the time of discovery.

During the tertiary and later epochs England has been joined to the mainland of the Continent, and this is proved by the mammalia that migrated hither after each successive emergence.

There is good reason to think that England and Ireland formed part of the mainland of the Continent for these extinct animals to have migrated (for they could only travel on dry land), and it is obvious that St. George's Channel was formed long before the Straits of Dover were excavated.

In Ireland there are only five species of reptiles; in England there are eleven; and in Belgium twenty-two. So that only five species got to Ireland before St. George's Channel was formed, and it would be a considerable time

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after that, geologically speaking, before England was separated from the Continent.

Our Eocene terrestrial fauna is the same as that of the Eocene of France. Our Miocene fauna is of the same general type as the fauna of the Continent—most of them extinct species, consisting of elephants, hippopotami, rhinoceroses, horses, deer, oxen, pigs, tigers, bears, beavers, &c. Mingled with the bones of extinct and modern species in Great Britain, flint implements and other works of man have been found. I have myself found in the excavation of the Worm Brook, near St. Devereux, flint knives and arrow heads, of the most perfect workmanship of their kind.

It has been proved, almost to a demonstration, that man, who fashioned these rude implements, existed at the time of the extinct animals. The climate under which the post-glacial animals lived was continental in character, the extreme cold of winter and the extreme heat of summer were more intense than when England became an island.

With each change of circumstance there is full geological proof that there has been a corresponding modification in the animal and vegetable world, so that the harmony between life and its surroundings has always been maintained. The common red deer, for instance, at the time when Britain formed part of the mainland of Europe, during the post-glacial epoch, in consequence of the large extent of its feeding grounds, grew to an enormous size, and possessed antlers much larger than those now borne by English varieties. During pre-historic times, after the insulation of Britain and the consequent submergence of the low-lying districts, the restricted range of its territory is manifested in the animal's diminished size; but even then it was far superior to any now living in Great Britain, for the cultivated lands were but an oasis in one large forest. From that time to the present the red deer has been growing smaller exactly in proportion to the restriction of its area. The difference in the size of the antlers is so marked, that it would be possible to ascertain, approximately, the antiquity of a deposit in which they might be found from that fact alone. There is another cause of its reduction in size. During post-glacial times men were few, and the lion and hyena prayed on the weakest and less active; while in the pre-historic period man increased and multiplied to such a degree, that he made an impression on wild animals, and as far as he could, selected the finest for his prey.

In regard to one of the sources of our domestic cattle, Bos longifrons, the animal has been found in no geological formation older than the comparatively modern alluvium and turbaries. The first evidence of its domestication is afforded by the remains in the Swiss lake dwellings belonging to the stone age. Throughout the ages of bronze and iron it was the principal food of the dwellers in France, Germany, Britain, and Italy.

The Bos longifrons, so far as we have any evidence, did not live with the rhinoceros or elephant, or any of the characteristic post-glacial animals. I believe the animal was introduced into Europe by very primitive herdsmen, along with

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the dog, the sheep, the goat, and the domestic horse; afterwards it became wild and spread over Europe as our own horses are now spreading over Australia. A very near relation of the animal still lives in the small hill cattle of South Wales.

I regret the tooth of the *Rhinoceros tichorinus* has been mislaid or lost; but at the time of its discovery I showed it to Mr. Symonds, who recognised it at once.

The remains of this species of rhinoceros, from their numbers and wide distribution, having roamed through the forests and perished in the floods of that portion of the ancient continent which now forms the British Isles, the *Rhinoceros tichorinus*, is characterised by the possession of a septum which insulates the one nostril from the other, and stands in direct relation to the development of a very large horn.

The discovery of the carcass of this animal in 1771, preserved in the frozen sand of the Wilouji, a tributary of the Lena, proves that, unlike all existing species of the genus, its hide was without folds, and that it was fitted to endure a climate of considerable severity by its clothing of hair. The remains swept down by the Pleistocene floods, and stored away in the dens of the Carnivora, prove that the animals of this species ranged in considerable numbers throughout the continent of which the British Isles formed then a part.

There is every reason to infer that it was during the glacial epoch, when Europe was covered with ice, that Britain was separated from the Continent, and that the floating ice of that period transported the Boulders, which we find strewn over the country. The famous Piérre à Bot, 50 feet long by 20 feet wide, and 40 feet in height, weighing 3,000 tons, forms one of a great belt of moraine blocks at a height of 800 feet above the level of the lake of Neuchâtel.

The general result has been that the whole of the regions of Britain have literally been moulded by ice. That is to say, the country in many parts was so much ground by glacier-action on a continental scale that, though in later times it has been scarred by atmospheric denudation, enough remains of the effects to tell the greatness of the power of moving ice.

Suddenly strip Greenland of its ice sheet and it would present a picture something like Britain immediately after the close of this glacial period. We have lately witnessed, on a small scale, an ice sheet that will help one to realise the glacial period.

To the lover of Nature it is interesting to know the forms of animals and vegetable life which lived on the earth before the present genera and species appeared; to trace the likeness of an animal or plant in one that lived in far off times (the units of the scale to measure such periods would be millions of years), and to note the marvellous adaptation and fitness of every creature to the circumstances which prevailed during the epoch in which it had existence.

And to the philosopher, and I would also say to the theologian, is it not interesting and of the highest import to examine the evidences of the consistency

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of the universe; to see the wondrous whole which science teaches us, particularly that science which this short paper brings before you? Modern geologists have been divided into three schools, viz.: catastrophists, uniformitarians, and evolutionists.

The first of these schools maintain that the forces which operated in the past were much more energetic than at present, and that these forces, acting with hundredfold intensity, caused great catastrophes or convulsions, far exceeding in violence any witnessed during the historical period.

The second school maintain that not only are the forces now operating sufficient to account for everything that has been observed, but that they are sufficient, even if they have never acted with greater intensity than now. That time and time alone is required to render possible the production of all geological phenomena, and that nature works uniformly; and that her laws never suffer change, never act with greater or less force; that the whole machinery of the universe is never accelerated and never retarded, but that all is working unchangingly and yet progressively. The late Sir Charles Lyell was the great exponent of this theory.

The third school admits that the present intensity is quite sufficient to account for all we see; but it is argued, may not these forces, acting continuously for lengthened periods, produce a set of circumstances, or a state of things, which will bring new forces into play, which will produce a new set of powers acting differently, and perhaps producing similar results in less, or it may be, in greater periods.

Professor Huxley is at the head of this school. It is really wonderful the numerous fossil remains of plants and animals that have been discovered in the mere superficial scratchings of the earth's crust when compared with the entire surface and cubical contents of the globe, which contains nearly 200 millions of square miles and nearly 264,000 millions of cubical miles.

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Woolhope Naturalists' Field Club.

THE FUNGUS FORAY.

OCTOBER, 1880.

THE following Papers were read and discussed during the week:—

A humorous paper by Dr. COOKE, entitled "Mushroom Sauce."

"The New Sclerotium disease in Irish Potatoes," by Dr. BULL.

"The British Hypomyces," illustrated by specimens and drawing, by Mr. C. B. PLOWRIGHT.

"Spirillum Jenneri," by Rev. J. E. VIZE, M.A.

"Notes on Thelephora Lycii, *Pers.*," recently found in Britain, by Dr. COOKE.

"Notes on the Spore diffusion of the larger Elvellacei," by Mr. C. B. PLOWRIGHT.

"The Luminosity of Fungi," by Mr. WM. PHILLIPS.

The valuable monograph of the British Hypomyces has been since beautifully illustrated and printed in *Grevillea*, Vols. 10 and 11, to which all those who are interested in the subject are referred.

For "Notes on Thelephora Lycii, *Pers.*," see *Grevillea*, Vol. 9, page 95.

The "Notes on the Spore diffusion of the larger Elvellacei" are also to be found in *Grevillea*, Vol. 9, page 47.

For complete list of Fungi found during the Woolhope Fungus Foray of 1879, at Holme Lacy, Foxley, Cabalva, and Dinmore, see *Grevillea*, Vol. 8, pages 73 and 109.

For Mons. le Docteur Quelets' paper on "The Fungi from the Jura and the Vosges," communicated in 1879, see *Grevillea*, Vol. 8, page 115.

The Programme of the Forays for this year (1880) was as follows:—

Tuesday, Oct. 5th.—Ludlow for Downton.
Wednesday, Oct. 6th.—Dinmore.
Thursday, Oct. 7th.—Club day—Holme Lacy.
Friday, Oct. 8th.—Moccas Park.

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Saturday, Oct. 9th.—Visit to Coed Coch, Denbighshire, for a Foray, on October 11th and 12th, under the general direction of Mrs. Lloyd Wynne and Rev. M. J. Berkeley.

Mons. Maxime Cornu, from Paris, again attended the Forays this year.

THE FUNGUS FORAY.

The fungus-hunters and fungus-eaters have for many years past held high festival in the old city of Hereford, during the first week of October.

It has become at length an established custom for all who are specially interested in mushrooms and toadstools, to gather together in the west and compare notes, as well as, in combination, to scour the woods and fields within the domain of the Woolhope Club.

The deeds of this Club in fungus-hunting are celebrated throughout Europe, and wherever a few enthusiasts are gathered together with such intent, the Woolhope foray is recognized as an institution. This is due mainly to the earnest and hearty manner in which the work is accomplished. It is undertaken as a work and a duty as well as a pleasure, and there can be no doubt of the fact that the Hereford mycologists enter thoroughly into the spirit of their fungus-hunting during the short period that it lasts. As a consequence, every year some new facts are determined, some new species discovered, and the fungus flora extended. The only serious drawback is the unsettled weather which often prevails at this period of the year. And this season the traditions of the Club have been realized as fully as ever, in daily drizzles, sometimes merging into a regular downpour. Monday, October 4th, was signalized by the arrival, one after another, of the Hereford visitors, until, as the appointed time for the evening meeting drew near, many had settled down in their quarters, and the rain commenced that steady precipitation which by daybreak the next morning had been registered as nearly two inches of rainfall. Some of the expected did not reach their destination until the following day, the muster including Messrs. Acton, Broome, Bucknall, Carrington, Cooke, Cornu, Howse, Perceval, Phillips, Plowright, and Vize. The opening prospect was by no means cheering, although the barometer was much more depressed than the spirits of the fungus-eaters, who gazed at the dull starless sky, and revived each other's reminiscences of past forays, when a dull beginning had a bright ending; and hopes for the morrow, which were never realized, accompanied the wearied travellers to their rest. The morning of Tuesday, October 5th, had been set apart for an excursion to Downton, but the rain had not ceased when the time for the departure of the train for Ludlow drew near, and the telegraph was put in requisition to signify to the Ludlow friends that the excursionists had resolved to postpone their visit until the morrow, in the hope that the elements would prove more favourable to the enterprise after another twenty-four hours. By this time it was evident that some of the most constant and persistent of the regular visitors would not be able to attend. Personal sick-

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ness, in one or two instances, was the undoubted cause; in others, domestic affliction; and in two or three, the heavy hand of time had pressed hard in the past year, and veterans of many years' experience were compelled to confess themselves no longer able to bear the fatigue and exertion of the Woolhope week. Expressions of sympathy with the absentees were heard all round, and these fraternal solicitations for a time imparted a serious and thoughtful expression to countenances already somewhat depressed by the atmospheric conditions. The party adjourned to the Free Library, where some objects of interest had already arrived, and the morning was devoted to their examination. Mr. Renny had sent, from Switzerland, living fungi unknown in this country, such as *Lactarius lignyotus*, *Polyporus ovinus*, *Hydnum geogenium*, and several others. Mr. Plowright had brought from King's Lynn, his splendid *Geaster coliformis*, which had not been found in this country for half a century, until he obtained it this year (see *Gardeners' Chronicle*, p. 439) [but see Mr. Currey's letter at p. 506].* Mr. Bucknall brought from the neighbourhood of Bristol, some sixteen rare and interesting fungi, amongst which, one which appeared to be the variety *lilacinus* of *Agaricus (Lepiota) seminudus*, regarded by some as a distinct species. Mr. Howse exhibited *Hydnum scrobiculatum* and *Polyporus cuticularis*. Mr. English sent from Epping, *Thelephora multizonata*, and Dr. Cooke brought from the same locality, *Agaricus ericæus* and *Agaricus udus*, the latter being new to the British flora. Rev. J. Stevenson also sent *Torrubia capitata* from Scotland, and a box

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*GEASTER COLIFORMIS IN NORFOLK.

I was much pleased to receive from my friend, Dr. J. D. Alexander, of Grimston, on Saturday last, September 25th, 1880, four fresh specimens of this rare *Geaster*, which, as far as I can make out, has not been found in Britain since the first decade of the present century. The specimens grew on a hedge-bank in the village of Hillington, Norfolk. The largest of them measures six inches across the widest part of the outer coat or peridium, which is divided into ten unequal rays; the inner peridium is no less than two inches in diameter, and has the beautiful silver-grey lustre mentioned by the older botanists, since whose time the fungus has hardly, if at all, been gathered in this country. In the specimen before me, as I write, the inner coat or peridium shines as if it were covered by a very thin coating of silver leaf, totally unlike any other *Geaster*. It has no less than forty distinct openings upon it. Another character not noticed in the text-book, is that the inner peridium is minutely tuberculated. Neither of these points struck me when I examined the specimen in the British Museum Herbarium some years ago; but they are both observable on careful observation in a specimen my friend Prof. C. A. J. A. Oudemans, of Amsterdam, sent me from Haarlem, gathered by him in January, 1877.

As showing the rarity of this species generally, it is worthy of note that Persoon, when he wrote the Synopsis in 1801, had seen no specimen, neither had Fries, when he wrote the Systema in 1829. In this countrv it has been found (1) by Doody, "in the lane from Crayford to Bexley Common" (Ray, Synop., ed. iii., p. 27, 1724); (2) by Mr. Merrett, at Hampton Court; (3) on sandy banks at Mettingham, Suffolk, and at Gillingham and Earsham, Norfolk, by Messrs. Stone and Woodward (Linnean Trans., vol. ii., p. 59); (4) at Hanley Castle, Worcestershire, by Messrs. Ballard and Rufford (Withering, ed. ii., vol iv., p. 460, 1792; Purton, Midland flora, vol. ii., p. 702; No. 1075, 1817). On the Continent it has been found at Haarlem and near Darmstadt (Fuckel, Symb. Myc., p. 37). The figure given (in vol. ii., plate xv.) by Mr. Worthington G. Smith, after Sowerby, t. 313, conveys a very accurate idea of the general appearance and habit of this fine *Geaster*.—CHARLES B. PLOWRIGHT, in *Gardeners' Chronicle*, October 2nd, 1880.

Geaster coliformis.—I have read Mr. Plowright's communication, at p. 439, as to *Geaster coliformis*, in which he suggests that the plant has not been found in England since 1810. I am not aware of any published notice of it, but knowing that my friend, Mr. G. B. Wollaston, had found it long since that time, I made enquiry of him. He tells me he found it in 1830, at Westwood, near Southfleet, in Kent, and again between 1836 and 1840, at Bridgen, near Bexley, in Kent; also, that in 1840 he saw a specimen found by a lady, at East Wickham, near Plumstead, in Kent; and he adds, "I have since found it recently, but when and where I do not recollect." I have thought that these facts might be of interest to your mycological readers.—FREDK. CURREY, *Gardeners' Chronicle*, October 16th, 1880, p. 506.

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of specimens of the interesting *Geaster fornicatus* was sent from Worcester. The examination of these gave employment throughout the morning, and as the rain had ceased by noon, a small party resolved upon a trip to Dinedor, and about eight, with baskets and umbrellas, started at half-past one for the old camp, and thus commenced the excursions of the week. It is needless to say that the ground was saturated, that the few fungi which were to be seen were almost unrecognisable. Here and there, the cap of an *Agaric* had fallen from its stem, and lay upon the ground like a dirty pat of butter, only to be taken up with a spoon. Only the firmest and least absorbent species could submit to be touched, but of these a sufficiency were collected to redeem the excursion from failure; and, despite the most unfavourable circumstances, no one returned without something; amongst which were *Geaster rufescens*, some species of *Lactarius*, and a few of the ordinary fungi which find a place on the tables at Hereford from year to year. One of the most interesting species found on this occasion, was an old log covered with a white *Corticium* as if with a crust. This was *Corticium lactescens*, which when cut or broken exuded a white milk, in the same manner as some species of *Lactarius*. As far as we are aware, this is the only milky species of *Corticium* known. Some kinds of *Sterium*, when wounded, turn reddish in colour as if bleeding, and at the same time a thin serum flows from the wound; but in *Corticium lactescens*, the juice is decidedly milky, like that of the *Spurge*, and somewhat acrid. The whole fungus becomes dark, horny, and cracked all over in drying, and then bears no resemblance to the living plant.

As one result of the experience of this week, it may be noted here that the number of species seen was very small, and of these the individuals were by no means numerous. Certain of the commoner species were entirely absent, only one small cluster of *Agaricus melleus* was seen during the week, and this species is generally so common as to be voted a nuisance. *Agaricus fascicularis* and *Agaricus sublateritius*, almost equally common at other times, were amongst the the rarest this season. Very few *Hygrophori* could be seen. *Lactarius* and *Russula* were the most plentiful. Scarcely a *Cortinarius* could be found, but *Polypori*, and especially the large and ligneous species, were more abundant than usual even in the best of years, *Polyporus fraxineus* in one instance extending for some yards, and of *Polyporus spumeus*, the largest and finest specimens ever seen by the oldest Woolhopian. If we add to this the almost total absence of *Coprinus*, we realise the principal features which characterised the mycologic flora of 1880, in the neighbourhood of Hereford.

Returning from this digression to our mycologists, we find them on Tuesday evening assembled at the residence of Dr. Bull, to recount the adventures of the day, and lay plans for the morrow, which the slightly rising barometer encouraged them in this instance to decide in favour of Ludlow and Downton. These evening reunions are habitually maintained through the week, but on the present occasion they were utilized more than heretofore, for the communication of papers and discussion on fungological topics, varied agreeably by one or two other subjects of general or special interest. Without detailing too minutely the opera-

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tions of every evening, we may record that the Rev. J. E. Vize read a paper on *Spirulina*, correcting an error into which he had fallen last year. This was supplemented by some remarks on *Spirogyra nitida*, another freshwater *Alga*. Mr. C. B. Plowright described some observations which he had made on the dispersion of the sporidia in *Morchella*. Mons. Cornu gave a most interesting general account of the *Phylloxera* of the Vine—its habits, destructive character, and the means adopted to check its ravages. Dr. Cooke exhibited and commented on some curious abnormal forms of ligneous fungi. One of these was a tropical *Lenzites* which had grown in the usual manner, and developed its hymenium on the under surface. When the tree on which it grew was thrown down, the surfaces were reversed, and the upper surface became the under, upon which a new hymenium was developed, so that the entire external surface was covered with the organs of reproduction. It was remarkable, further, that although the first or normal hymenium had the character of a *Lenzites*, the abnormal hymenium resembled that of a *Daedalea*.

Another specimen exhibited was that of *Polyporus lucidus*, a common fungus all the world over. This specimen had also become inverted, but instead of forming a new hymenium on the under surface, the true hymenium was obliterated, except a small space which might be covered with the thumb, by the growth of an external cuticle similar to that covering the upper surface. Another specimen of an exotic *Polyporus* was notable for the growth of young *Polypori* in a parasitic manner on both surfaces of the parent.

Wednesday morning was by no means promising, but soon after nine o'clock the majority of the mycologists were on their way to the railway station, and thence by train to Ludlow, the ride from Ludlow being undertaken in open carriages. Until the luncheon hour (half-past one) there was no rain, and the woods were explored, despite the soft and juicy soil, with an ardour worthy of the Woolhopians. With unabated zeal the luncheon baskets were emptied of their contents. All those who have made this excursion on previous occasions, know better than we can inform them what excellent cheer is so freely and liberally provided, and who are the entertainers, nor need we say why a wag should have called the luncheon "going into quarantine." These are mysteries known only to the initiated. No sooner had the party left the "salle à manger" than the rain commenced its pranks again, at first lightly, afterwards in a deluge almost worthy of the ever-to-be-remembered "Whitfield day," when, some years ago, a Woolhope excursion to Whitfield was deluged by such a downpour as is rarely experienced. The appearance of the entire party as they drove into Ludlow after an eight miles ride through incessant rain, might have afforded some amusement to the inhabitants, had any been visible, but the streets were deserted, and the good people were too polite to gaze at us from the windows. New, rare, and remarkable fungi were absent from the baskets, which, nevertheless, were by no means empty, for there was one *Strobilomyces*, some fine specimens of *Agaricus radicosus*, besides several species of *Lactarius* and *Russula*. It became manifest that the year was altogether an exceptional one, and as one of the best localities

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in the programme exhibited such a dearth of fungi, all hope of providing extra tables were abandoned in favour of a resolve to do all that could be done under the circumstances, to maintain the reputation of the Club.

The morning of the "foray" day was as gloomy as any of its predecessors, and although Thursday was fixed for an excursion to Holme Lacy, only a very few had the courage to brave the drizzling rain in search of some fungi to be cooked for dinner. As fortune favours the brave, so on this occasion sufficient was collected of that excellent, but generally despised, Toadstool, the *Coprinus comatus*, and another fungus allied to the mushroom, *Agaricus hæmorrhoidalis*, to supply the tables at the "Green Dragon" in the afternoon. It is unnecessary to say that as the trains ran up and down at intervals during the day, all the excursionists took an early opportunity of returning as soon as they discovered the conditions under which their explorations would have to be conducted, or had collected what was requisite for the table. There really seemed to be some truth in the ditty which one of the party was humming to himself:—

"Oh, ever thus from morning hour,
When with the Woolhope Club I've strayed,
I've seen the rain a deluge pour,
The fungi sodden and decayed.
I never knew a foray yet
That did not all my hopes betray—
I always am so drenching wet
Upon a Woolhope day."

After a brief meeting for the despatch of business, the election of President and the appointment of Thursday, October 6th, 1881, for the next foray, the Club adjourned to the hotel for dinner. About sixty-five persons sat down, with the President at the head of the table, supported on one side by the High Sheriff of the County, and on the other by the Mayor of the City. The preliminaries of eating and drinking being disposed of, Dr. Bull addressed the company in his usual vivacious and happy manner. This was followed by a welcome for the visitors, and replies thereto in acknowledgment, when two papers were read in accordance with the programme, viz.:—one by Dr. Cooke, entitled "Mushroom Sauce," which dealt with many things in general, and nothing in particular; and one by Dr. Bull, on the "Sclerotium Disease of Potatoes." The character of the former may be guessed from the following paragraph:—"When sane men are found scampering over miles of country, like escaped lunatics, for the avowed purpose of collecting, smelling, and even tasting the filthiest and slimiest of toadstools that ever flourished on a dunghill; bringing into this respectable city whole basketfuls of the most disgusting stenches that ever assailed the nose of a sanitary inspector, this monomania must be attributed to 'Mushroom Sauce.'" In the latter paper Dr. Bull summarised the Potato diseases, with especial reference to the new form of disease found in Ireland, and attributed it to a small *Sclerotium* in the haulms (see *Gardeners' Chronicle*, p. 264). At eight o'clock in the evening a soirée was held at the residence of Thomas Cam, Esq., when the following communications were made—"On the Species of Hypomyces found in Britain," by C. B. Plowright, followed by some supplementary observations by M. Cornu; and on "The Luminosity of Fungi," by Wm. Phillips, F.L.S., followed by a

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short discussion, and the exhibition in a dark room of a specimen of luminous wood, traversed by the mycelium of a fungus. In the course of discussion it was mentioned as a curious fact that all the species of luminous *Agarics* known are white spored, and belong to the same sub-genus, that of *Pleurotus*.

The programme for Friday was an excursion to Moccas Park in open carriages, which the weather permitted to be carried out, but, in revenge, a pelting shower accompanied the excursionists back to town in the evening, so that there might not be a single day during the week without some small contribution to the rainfall of the year.

At Moccas, the party was conducted over the most interesting gardens, by Sir George Cornewall, and afterwards to the Moccas Oak and other remarkable trees in the Park. This is considered one of the best hunting-grounds for fungi in the neighbourhood of Hereford, but on the present occasion these were conspicuous for their absence; not a single cluster of *Agaricus melleus*, or a specimen of *Panus stypticus* could be found, but the larger *Polypori* were abundant. A large ash which had been blown down, had its stump completely surrounded by large specimens of *Polyporus fraxineus*. In other parts of the park, *Polyporus fomentarius*, was found and sliced up into sections, in order to exhibit the substance, which, when duly prepared, is called "Amadou," or "German Tinder." *Trametes mollis*, *Polyporus frayilis*, *Grandinia granulosa*, clusters of *Peziza aurantia*, from six to eight inches in circumference; the *Nectria aurea* of Greville, the *Sclerotium* of Eleocharis, which, when matured, produces the *Claviceps nigricans*, were amongst the spoils of the day. Compared with its predecessors, this locality will be entitled still to maintain its pre-eminence, and, had the conditions been more favourable for perambulation, good baskets might undoubtedly have been filled, but the exhibition day was past, enthusiasm had cooled, and with wishes for "better luck next year," the return journey was undertaken.

Saturday, at the hour of noon, a railway train started for Chester, en route for Coed Coch, bearing a compartment filled beyond the boundary of comfort with such of the fungus-hunters as had been invited to try a few days in North Wales; others had already gone southward to their homes. There was no rain, the barometer was rising, there was blue in the sky, and joy in the hearts of the travellers, whichever way their engine was turned. A screech, and a snort, and then the train moved slowly onward and swept the railway travellers towards their destination, and the Woolhope Foray of 1880 into the past.—M. C. C., *Gardeners' Chronicle*, *October* 23*rd*, 1880.

COED COCH,

The residence of J. Lloyd Wynne, Esq., has long been celebrated for the beauty and interest of its garden, and has become quite classical as regards mycology, in consequence of the very numerous additions to our list of indigenous fungi, due to the exertions of Mrs. Lloyd Wynne. It was suggested by Mrs. Wynne, in con-

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junction with her neighbour, Mr. Walker, of Colwyn, that after the meeting of the Woolhope Club at Hereford, much might be found to interest the members in the neighbourhood of Coed Coch.

Arrangements were therefore made to invite as many of the leading members and visitors as could be accommodated; and accordingly one party arrived on Saturday, October 9th, at Colwyn, and another at Coed Coch, under the guidance of Dr. Bull, and amongst them M. Max Cornu, a host in himself. Meanwhile collections were made on Saturday by Mr. Berkeley and his daughter, to greet them on their arrival, and an addition to our list was recorded in *Agaricus senilis*. *Ag. Leveillianus* was abundant, and proved to be identical with *Ag. denigratus*, Fries.

Both parties joined, on Monday, in an excursion to the woods in the neighbourhood of Colwyn, when amongst other interesting matters, *Ag. tumidus*, *P.*, new to this country, was collected. *Ag. tessulatus*, *Bulliard*, a form of *Ag. ulmarius*, occurred altered by patches of a red *Fusisporium*; a similar change also taking place in *Ag. orcella*. The most interesting find, however, was *Ag. nudipes*, *Kalkbrenner*, which was gathered by Mrs. Wynne herself. A single specimen of *Hygrophorus Wynniæ* was found, which excited great interest. On Monday, the meet was joined by Sir W. Guise and Mr. Bucknall, who brought with him *Ag. seminudus*, new to this country, and a very beautiful undescribed species of *Lepiota*. Mr. Renny sent from Lucerne, a valuable collection, and some exquisite drawings. Mr. Shaw and Mr. Bucknall also brought drawings of rare species, and the meeting was well supplied with illustrative books.

A joint excursion was again made, on Tuesday, to the Pine Wood of Coed Coch, which furnished a plentiful supply of interesting species. All were accurately named and labelled as far as time would allow, so that the meeting was highly instructive, and M. Cornu closed the evening with a charming lecture on the "Comparative Mycology of France and England." The weather was all that could be desired, so that the members thoroughly enjoyed themselves, and will long remember the happy days spent at Coed Coch and Colwyn.—M. J. B., *Gardeners' Chronicle*, *October* 16*th*, 1880.

COED COCH AND COLWYN FUNGI.

By invitation of Mrs. Lloyd Wynne and Mr. A. O. Walker, a party of mycologists visited these localities for two or three days, from the 9th October; and the following list includes the majority of species found during the excursions. Others have been collected since by the Rev. M. J. Berkeley, of which a special record will probably be given by that gentleman. As no extensive list of the North Wales fungi has been published, we give the list in its entirety, although it represents only the result of two or three consecutive days, and must therefore be regarded as fragmentary.

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AGARICUS.
acerbus, *Bull.*
acicula, *Sch.*
æruginosus, *Curt.*
albus, *Fr.*
alcalinus, *Fr.*
arvensis, *Schff.*
bifrons, *B. & Br.*
Bloxami, *B. & Br.*
brevipes, *Bull.*
brumalis, *Fr.*
butyraceus, *Bull.*
campestris, *L.*
capnoides, *Fr.*
carcharias, *P.*
cervinus, *Sch.*
chalybeus, *P.*
cinerascens, *Bull.*
clavipes, *Fr.*
columbetta, *Fr.*
confluens, *P.*
corrugis, *P.*
cristatus, *Fr.*
cucumis, *P.*
epipterygius, *Scop.*
equestris, *L.*
euthelus, *B. & Br.*
excelsus, *Fr.*
fascicularis, *Huds.*
fastibilis, *Fr.*
fibula, *Bull.*
flaccidus, *Sow.*
flavidus, *Sch.*
fœnisecii, *P.*
fragrans, *Sow.*
galopus, *Schr.*
geophyllus, *Sow.*
giganteus, *Fr.*
gracilis, *Fr.*
grammopodius, *Bull.*
granulosus, *Batsch.*
hypnorum, *Batsch.*
inamœnus, *Fr.*
infundibuliformis, *Sch.*
inopus, *Fr.*

AGARICUS.
jubatus, *Fr.*
laccatus, *Scop.*
lenticularis, *Lash.*
longicaudus, *P.*
Mappa, *Batsch.*
melleus, *Vahl.*
mitis, *B.*
mollis, *Sch.*
mutabilis, *Sch.*
nebularis, *Batsch.*
nidorosus, *Fr.*
nudipes, *Fr.*
odorus, *Bull.*
parabolicus, *A. & S.*
pascuus, *P.*
phalloides, *Fr.*
phyllophilus, *Fr.*
prunulus, *Scop.*
purus, *P.*
pyriodorus, *P.*
rachodes, *Vitt.*
radicatus, *Relh.*
radicosus, *Bull.*
resplendens, *Fr.*
rimosus, *Bull.*
rosellus, *P.*
rubescens, *P.*
rugosus, *Fr.*
rutilans, *Schff.*
sanguinolentus, *A. & S.*
saponaceus, *Fr.*
semiglobatus, *Batsch.*
semilanceatus, *Fr.*
senilis, *Fr.*
separatus, *L.*
spadiceus, *Sch.*
spectabilis, *Fr.*
sulfureus, *Bull.*
tener, *Sch.*
tenerrimus, *B.*
terreus, *Sch.*
tuberosus, *Bull.*
tumidus, *Fr.*
vaccinus, *P.*

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AGARICUS.
velutipes, *Curt.*
vulgaris, *P.*
COPRINUS.
comatus, *Fr.*
micaceus, *Fr.*
plicatilis, *Fr.*
BOLBITIUS.
fragilis, *Fr.*
CORTINARIUS.
anomalus, *Fr.*
cinnamomeus, *Fr.*
Cookei, *Quel.*
diabolicus, *Fr.*
elatior, *Fr.*
hinnuleus, *Fr.*
ochroleucus, *Fr.*
purpurascens, *Fr.*
GOMPHIDIUS.
roseus, *Krom.*
HYGROPHORUS.
conicus, *Fr.*
hypothejus, *Fr.*
miniatus, *Fr.*
psittacinus, *Fr.*
virgineus, *Fr.*
Wynniæ, *B. & Br.*
LACTARIUS.
circellatus, *Fr.*
controversus, *P.*
deliciosus, *Fr.*
pyrogalus, *Fr.*
rufus, *Fr.*
serifluus, *Fr.*
subdulcis, *Fr.*
torminosus, *Fr.*
vellereus, *Fr.*
,, *var.* exsuccus, *Sm.*
RUSSULA.
cyanoxantha, *Fr.*
emetica, *Fr.*
fellea, *Fr.*
fragilis, *Fr.*
heterophylla, *Fr.*
integra, *Fr.*
nigricans, *Fr.*
RUSSULA.
Queletii, *Fr.*
rubra, *Fr.*
subfætens, *Sm.*
CANTHARELLUS.
aurantiacus, *Fr.*
cibarius, *Fr.*
MARASMIUS.
androsaceus, *Fr.*
epiphyllus, *Fr.*
erythropus, *Fr.*
Hudsoni, *Fr.*
oreades, *Fr.*
peronatus, *Fr.*
BOLETUS.
bovinus, *L.*
chrysenteron, *Fr.*
edulis, *Bull.*
elegans, *Schum.*
felleus, *Bull.*
laricinus, *B.*
luteus, *L.*
pachypus, *Fr.*
subtomentosus, *Fr.*
POLYPORUS.
adustus, *Fr.*
aneirinus, *Fr.*
annosus, *Fr.*
fragilis, *Fr.*
molluscus, *Fr.*
picipes, *Fr.*
rufescens, *Fr.*
squamosus, *Fr.*
vaporarius, *Fr.*
versicolor, *Fr.*
vulgaris, *Fr.*
DÆDALEA.
quercina, *P.*
FISTULINA.
hepatica, *Fr.*
MERULIUS.
corium, *Fr.*
pallens, *B.*
HYDNUM.
ochraceum, *Fr.*
repandum, *Fr.*

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HYDNUM.
udum, *Fr.*
RADULUM.
orbiculare, *Fr.*
GRADINIA.
granulosa, *Fr.*
CRATERELLUS.
crispus, *Fr.*
THELEPHORA.
caryophyllea, *Fr.*
laciniata, *Fr.*
STEREUM.
acerinum, *Fr.*
purpureum, *Fr.*
rugosum, *Fr.*
spadiceum, *Fr.*
CORTICIUM.
arachnoideum, *B. & Br.*
comedens, *Fr.*
giganteum, *Fr.*
incarnatum, *Fr.*
læve, *Fr.*
punctulatum, *Cke.*
sambuci, *Fr.*
PENIOPHORA.
cinerea, *Fr.*
quercina, *P.*
rimosa, *Cke.* n.s.
velutina, *Fr.*
CYPHELLA.
villosa, *P.*
CLAVARIA.
coralloides, *L.*
inæqualis, *Mull.*
rugosa, *Bull.*
CALOCERA.
viscosa, *Fr.*
PISTILLARIA.
quisquilaris, *Fr.*
TREMELLA.
albida, *Huds.*
mesenterica, *Retz.*
HIRNEOLA.
auricula-Judaæ, *Fr.*
NÆMATELIA.
encephala, *Fr.*
DACRYMYCES.
stillatus, *Nees.*
deliquescens, *Dub.*
SCLERODERMA.
bovista, *Fr.*
PHALLUS.
impudicus, *L.*
LYCOPERDON.
saccatum, *Vahl.*
gemmatum, *Fr.*
pyriforme, *Schff.*
STEMONITIS.
fusca, *Roth.*
TILMADOCHE.
nutans, *R.*
CHONDRIODERMA.
floriforme, *R.*
ARCYRIA.
punicea, *P.*
TRICHIA.
chrysosperma, *D.C.*
TUBULINA.
cylindrica, *Bull.*
CYATHUS.
striatus, *Hoffm.*
CRUCIBULUM.
vulgare, *Tul.*
PHRAGMIDIUM.
bulbosum, *Schl.*
COLEOSPORIUM.
tussilaginis, *Lev.*
ÆCIDIUM.
tussilaginis *P.*
RHINOTRICHUM.
repens, *Preuss.*
POLYACTIS.
cinerea, *Lk.*
ZYGODESMUS.
fuscus, *Ca.*
ÆGERITA.
candida, *P.*
ERYSIPHE.
horridula, *Lev.*
Martii, *Lk*
LEOTIA.
lubrica, *P.*

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PEZIZA.
badia, *P.*
calycina, *Schum.*
cinerea, *Batsch.*
cyathoidea, *Bull.*
Dalmeniensis, *Cke.*
firma, *P.*
leporina, *Batsch.*
scutellata, *L.*
stereicola, *Cke.*
succosa, *B.*
umbrorum, *Fckl.*
vinosa, *A. & S.*
virginea, *Batsch.*
vulgaris, *Fr.*
HELOTIUM.
aciculare, *Fr.*
æruginosum, *Fr.*
claro-flavum, *Grev.*
pruinosum, *Jerd.*
virgultorum, *Fr.*
BULGARIA.
sarcoides, *Fr.*
RHYTISMA.
acerinum, *Fr.*
NECTRIA.
cinnabarina, *Tode.*
Ralfsii, *B. & Br.*
mammoidea, *P. & P.*
sinopica, *Fr.*
HYPOCREA.
rufa, *Fr.*
HYPOMYCES.
aureo-nitens, *Tul.*
HYPOMYCES.
chrysospermus, *Tul.*
rosellus, *Tul.*
XYLARIA.
hypoxylon, *Grev.*
HYPOXYLON.
coccineum, *Bull.*
confluens, *Tode.*
rubiginosum, *Fr.*
serpens, *Fr.*
DIATRYPE.
disciformis, *Fr.*
ferruginea, *Fr.*
nucleata, *Curr.*
quercina, *Fr.*
stigma, *Fr.*
DOTHIDEA.
graminis, *P.*
pteridis, *Fr.*
EUTYPA.
Acharii, *Tul.*
flavo virens, *Tul.*
lata, *Tul.*
VALSA.
ambiens, *Fr.*
stellulata, *Fr.*
SPHÆRIA.
acuminata, *Sow.*
aquila, *Fr.*
innumera, *B. & Br.*
inquilina, *Fr.*
ovina, *P.*
phæostroma, *Mont.*
pæcilostoma, *B. & Br.*

ON SPORE DIFFUSION IN THE LARGER ELVELLACEI.

[By CHAS. B. PLOWRIGHT—Read October 8th, 1880.]

WE have all frequently observed the clouds of sporidia, resembling puffs of smoke, which take place from the hymenia of the larger *Peziza*, in a ripe condition. These jet-like expulsions of sporidia are apt to convey a very incorrect notion of

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the manner in which the fruit of this group of fungi is disseminated under ordinary circumstances. The jet-like clouds of smoke are the result of the rupture of a number of asci simultaneously. They occur only when the *Peziza* has attained full maturity, the asci being, so to speak, in a state of tension, from their contents having attained the maximum amount of development. Under such circumstances the giving way and consequent emptying of one ascus, disturbs the equilibrium of those in immediate contact with it, and as they are fully matured, the slight concussion thus produced is a sufficient exciting cause to render manifest the latent elasticity of their walls; the measure of which elasticity being determined by the distance to which the cloud is expelled.

On the 29th May, 1879, I gathered about one hundred specimens of *Morchella gigas*, Pers., and laid them out separately upon boards in my study. In the evening, as the rays of the setting sun fell obliquely upon them, I observed that all the older specimens were quietly and continuously diffusing their sporidia. Each sporidium was distinctly visible to the naked eye, floating in the air, twisting and turning in the sunlight. The head of each of the morells in question was surrounded by a cloud of sporidia extending three or four inches above and around it. This cloud could only be seen in the oblique light against a dark background. When acted upon by a gentle current of air, such as would be produced by gently waving the hand, it swayed to and fro, without manifesting any tendency to become dispersed. The component sporidia were in constant motion, rising and falling, and circling about, as if the law of gravity were a myth, existing only in the imagination of philosophers. When the cloud was blown quite away by a more powerful air-current, it, in the course of a few seconds, re-formed. The contents of each ascus could be seen to be separately ejected in a minute jet, consisting of a limited number of sporidia, which speedily became lost with the others forming the cloud.

The phenomenon above described is interesting from a physiological point of view, as showing the capabilities of the unaided human eye. These sporidia measured only about one-hundredth of an inch in their long diameter, and five-one-thousandths of an inch in their short—yet they could distinctly be seen to be bodies having length and breadth.

That the process above described is the normal mode in which the sporidia of the *Morchellæ* are diffused, and not the result of an accidental chain of circumstances, is further shown in another way. A lady who has a particularly irritable skin, and who has often accompanied me in my mycological excursions, was never able to gather Morells without suffering from a very unpleasant erythema of the face, the explanation of which was never arrived at until the above observations were made, although experience had taught her that the Morells must always be kept at arm's length.

What particularly struck me when observing these spores being given off, was the facility with which they floated in the air, having little or no tendency to

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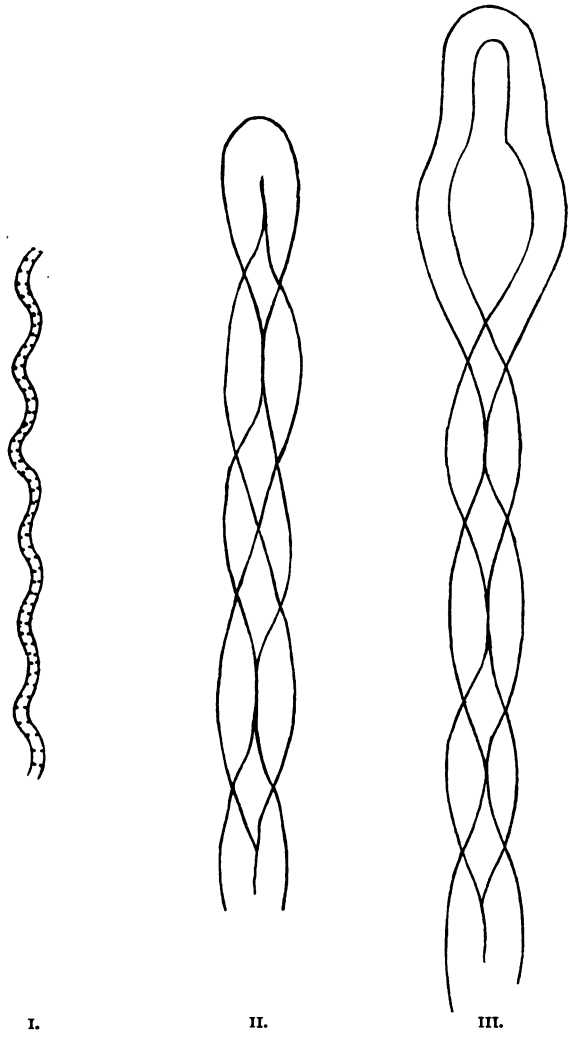

I. II. III.

SPIRILLUM JENNERI.

I.—Represents the plant magnified 500 times. II, III.—Show the entangled filament in the extreme movements to and from each other magnified gigantically.

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subside. Their specific gravity must be very low, and this, aided by their gyrations, will account for the extensive and, when aided by air-currents, rapid diffusion of Elvellaceous sporidia.

ON A SINGULAR FORM OF SPIRILLUM JENNERI—*Hass.*

[By Rev. J. E. Vize, M.A., F.R.M.S., Vicar of Forden—Read October, 1880.]

In the month of June of the present year, a friend was staying with me whose name in connection with *Algæ* is well known. I mean Mr. Wills, of Wylde Green. We visited a few of the pools in Powis Castle Park, and in the pool situated the nearest of all to the castle entrance, and facing south-west of the castle, we found some freshwater *Algæ*. *Spirillum Jenneri* was one of these. *Spirillum*, I may say, is a genus closely allied to *oscillitoriæ*. The whole family is *oscillatoriaceæ*, and has very wonderful movements. When seen under a microscope, there is a constant motion going on. They oscillate, move stealthily along, or in a snake-like movement, the rapidity of their growth being almost as striking as their movement. The *Spirillum* we found, as I believe is always the case, was mixed up with a considerably predominating quantity of *oscillatoria*—a set of plants easily distinguished from *Spirillum* by the thread-like filaments being straight instead of spiral. Nearly all the filaments were single, but there were instances, here and there, in which two of these filaments had interlaced; and to see them working together was amongst the most wonderful sights I ever witnessed. Do justice to it I could not. Nevertheless, it would not be right to refuse to give any idea about it, imperfect though it must be. Suppose two very long snakes or screws of two corkscrews, the coils of which were for a very great distance indeed the same diameter—imagine that these two serpentine things progressed most elegantly backwards and forwards in the water, for they are never still, although their movement is slow and deliberate, and I should think uniform as to their number per hour. Let two approach each other so exactly that they just hit the right place for one to descend whilst the other ascends the coil. In this case you get the double twist, and very superb is the sight. The filaments are fine as to size, and delicate as to colour, which is a light green. For a time this descending of the one coil whilst the other ascended would go on. Presently there would be a stoppage of motion, and the very reverse progress would commence. The originally upward coil would be the downward now, and the downward the upward. This would be reversed again in due course of time, and the changes again and again occur. It may be well to say that these double forms appeared to be confined to one special spot in the material from which the specimens were obtained from the mass of *oscillatoria*, and I fancied there was in that spot a slightly altered tint of colour.

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But amongst the mass of material was one film which as far surpassed in interest the rest as possible. Mr. Wills and myself became fairly ecstatic when we saw it. The single filament by some process had turned one end downwards, and become so entangled in the coil that it could not get back again. The movements, to all intents and purposes, were exactly the same as described already for the double coil, except at the extreme top, and it is to that movement that I attach so much interest as to give a paper on *Spirillum*. You can easily see that if a serpentine movement continued only in one way all along the thread continuously it would soon cease its motion when entangled at the top as my specimen was; but inasmuch as the movement reversed itself, a very beautfiul form became visible, the countermotions making the thread at one time just as coils of whipcord would be, if it were possible to give them exactly corresponding motions to the *Spirillum*. At one point of the twisting process, the coil would be just as string tightly twisted, but at the very opposite point the twist was as though you held a fragment of the top with one finger and thumb firmly, and a very short distance below used your other hand similarly, and brought your two hands together a small distance, thereby making a sort of loop, which loop gave an appearance like the accompanying sketch. With the exception of the wonderful movements to be seen under the microscope, when examining the ciliary processes of zoophytes, I never witnessed anything which in every way was more beautiful than *Spirillum Jenneri*.

THE LUMINOSITY OF FUNGI.

[By WILLIAM PHILLIPS, F.L.S.]

THE luminosity of fungi is a phenomenon which has always been of great interest to Mycologists, and one that not unfrequently comes under their observation. I venture to think the subject is by no means exhausted, and that many problems connected with it remain unsolved; hence it may not be out of place to point out, in a few words, the direction our investigations should take. Those living in a well-wooded county like Herefordshire possess great facilities for the work, having near at hand an abundance of decaying timber, on which luminous fungi are generally found. Would it be too wild a proposal to make, that we should organise a midnight foray in search of specimens? I am aware we should run no small risk of being seized as poachers and dragged ignominiously to the county lock-up, and there be left to pine till break of day, but what of that if the exigencies of science demand it?

In default of undertaking such a novel excursion I would suggest that we put ourselves in communication with keepers on large estates, whose duty leads them through the woods at night to guard the game, to inform us of any instances of luminosity in rotten wood that may come under their notice. Autumn and early winter is the proper time to institute inquiry, for then the fungi which pro-

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duced the light would be in perfection, whereas at other seasons the mycelium alone would be present, which is not easy of identification without the perfect plant.

The species of fungi which have been proved on the most reliable evidence to have shown luminosity, are the following:—

Agaricus olearius, D.C. - - -	Europe
Agaricus igneus, Rumph. - - -	Amboine
Agaricus noctilucens, Lév. - - -	Manilla
Agaricus Gardneri, Berk. - - -	Brazil
Agaricus lampas, Berk. - - -	Australia
Agaricus Emerici, Berk. - - -	Andaman Islands
Polyporus annosus, Fr. - - -	Europe
Polyporus suphureus, Fr. - - -	Europe
Didymium, Sp? - - - -	Jamaica

Species reputed to be luminous, but about which there is room for doubt, are the following:—

Agaricus fascicularis, Huds. - -	Europe
Corticium Cœruleum, Schrad. - -	Europe
Corticium lacteum, F. - - -	Europe
Cladosporium umbrinum, Lin. - -	

To these should be added *Rhizomorpha*, which is no longer regarded as a perfect fungus, but as the mycelium of, probably, *Xylaria hypoxylon*, Grev., found very commonly on decayed stumps.

The British species amongst those named are *Agaricus fascicularis*, which is doubtful, but being one of the commonest of common fungi on old decaying stumps in the autumn, ought not to remain in the doubtful list; *Polyporus annosus*, also on decaying stumps, and less common than the last,—affirmed to be luminous by Mr. Worthington Smith; *Corticium cœruleum* not unfrequent on much decayed timber, recognised as luminous by many of the older mycologists, and figured by Sowerby, plate 350, under the name of *Auricularia phosphorea; Corticium lacteum*, under its old name of *Himantia candida*, said to be luminous; and *Rhizomorpha*, whatever it may be the mycelial stage of, which is undoubtedly luminous at times.

It is not my purpose to describe the curious appearances presented by the phosphorescent light emitted by fungi, or their mycelium, in rotten wood, this having been done by Dr. Cooke in his recently published book "*Fungi: their Nature and Uses*," where many interesting facts have been collected from many sources, but to propose a few questions which at present remain unanswered.

1st.—To what particular species of fungus or fungi is the phosphorescence of decaying wood to be attributed?

I assume that it is from the presence of some kind of mycelium, but it has always appeared to me very difficult to determine to what species the mycelium belonged. So far as my own observations have gone, I am ready to confess I have

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never been able to satisfy myself on the point. In one particular instance I brought home in my vasculum some pieces of wood, which I was not aware were luminous till I discovered they were so by seeing the light on my study table in the evening. There were three species growing on this wood,—*Polyporus versicolor*, *Peziza vulgaris*, and *Licea fragiformis*, or as it is now called *Tubulina fragiformis*. Neither of these when removed from the wood gave out any light, yet the wood immediately beneath them could be seen, by the aid of the microscope, to be traversed by mycelium, and was decidedly luminous. There was no character in the mycelium by which it could be referred to either of the species present, and hence I was impressed with the difficulty that surrounds this question. The mere presence of certain perfectly developed species does not account necessarily for the phenomenon. In the case of *Rhizomorpha* it is otherwise, because it is large, dark coloured, and can be removed from the wood while it retains its luminosity. M. Ludwig gives the result of his examination of pine-wood attacked by *Rhizomorphia* (*Gardeners' Chronicle*, 1874, p. 361). He found that on moistening the wood it became luminous, and that this was owing to the fungus mycelium which lay between the bark and wood. The mycelium was separated from the wood and remained luminous, while by so doing the wood itself was deprived of its luminosity. Mr. Worthington Smith gives an account in *Gardeners' Chronicle*, 1877, p. 83, of a remarkable case of phosphorescent fungus-spawn found permeating the wood of a rotten oak-stump, sent to him by Capt. King, of Chiselhurst, which was kept under view for some time, and produced a dense crop of *Agaricus fascicularis;* at least it "apparently" sprang from the same dense white spawn which was luminous the year before. It would seem from the use of the word "apparently" it was not absolutely certain; besides, we learn from an earlier account of the same wood in the *Gardeners' Chronicle* for 1875, p. 719, that there were present in some places mucilaginous masses where the luminosity was visible, also *Rhizomorpha* was present, and something like a purplish mass, which suggested *Corticium cœruleum*.

2nd.—Has luminosity been observed in any British fungus apart from its mycelium?

There is an *Agaric* in the South of France which occurs upon the olive tree, *Ag. olearius*, which is undoubtedly luminous. M. Delile stated, that the only portion of this plant which is luminous is the inferior face of the gills, while M. Tulasne satisfied himself that specimens he examined were frequently luminous beneath, above, and within the pileus, and on the surface and within the stem, although he found some young specimens in which the gills alone were so. (*Ann. des Sc. Nat.*, Vol. ix., p. 338, 1848). Fries affirmed that the luminosity of this species was owing to a parasitic fungus, *Cladosporium umbrinum*, in which opinion neither Tulasne nor Berkeley agreed. Again, in *Agaricus Gardneri* Berk., from Brazil, and *Agaricus Emerici* Berk., from the Andaman Islands, the whole plant is luminous. The only cases in this country I have been able to find a record of is given by Mr. Worthington Smith (*Science Gossip*, 1872, p. 118), where he mentions *Polyporus annosus*, taken from a coal mine at Cardiff, as being lumi-

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nous both in itself and its mycelium; he had also seen *Polyporus sulfureus*, luminous; and he adds, that Mr. C. E. Broome had met with a luminous *Corticium*, the name of which is not given. It would appear to be a very rare circumstance to alight upon a fully developed fungus showing this property.

3rd.—May we assume that all reputedly luminous species exhibit this phenomenon at some period of their growth, and if so, what are the favourable or adverse conditions which affect luminosity?

That one often meets with the species belonging to this country without observing any luminosity in them does not of itself dispose of the first part of this question. The life of these plants often extends over two months or more, and they require to be watched in their early development, their maturity and decay, and also in the varying conditions of the atmosphere, before it can be affirmed that species reputed to be luminous in particular instances never are so. When we bear in mind their place of growth, in remote spots in dense woods, and that the light is only visible in the night time, the difficulty of arriving at the facts will be evident. M. De Candolle considered that *Agaricus olearius* was luminous in a state of decay, while M. Tulasne, who conducted a long series of careful observations on this species, satisfied himself M. De Candolle was mistaken, and that it was luminous only while the plant was in full vigour of growth, thus confirming the opinion of M. Delile, who also carefully studied this species, and declared that the luminosity ceased at the moment when the fungus ceased to grow, and that even while growing it did not at all times exhibit it. Mr. Worthington Smith in some experiments on wood luminous from the presence of *Rhizomorpha* found, that after extinguishing it by three methods, viz.,—saturation in oil, immersion in boiling water, and freezing in solid ice, it again recovered. Tulasne on the other hand found, that although he could revive specimens of *Rhizomorpha* which had been luminous, but had been dried for a month, so that they would grow, he never observed a revival of their luminosity. The most recent experiments that I can discover are those instituted by M. Ludwig (and quoted by A.B.M. in *Gardeners' Chronicle*, 1874, p. 361), on pine wood attacked by *Rhizomorpha*. He states, that raising the temperature tended to increase the luminosity. The upper limit he found to be 50° cent., which utterly extinguished it. Fabre found the same limit in *Agaricus olearius;* Tulasne found 55° cent. the limits in *Rhizomorpha;* Humboldt, for decayed wood 50° cent. Ludwig found the lower limit to be the freezing point, while Bacon and Heinrich saw wood luminous under 0°. He also found that ordinary water did not affect it, while water that had been boiled and left to cool in a close vessel extinguished it in 20 minutes. Such are some of the variable results arrived at by different observers as to the conditions affecting this property of fungi. I tried the experiment of moistening in water a specimen of *Agaricus Emerici*, one of the most remarkable of luminous species given me by Mr. Berkeley, in the hope of reviving some trace of its character, but the experiment was unsuccessful. For my own part I have never seen perfectly dry wood luminous, and I am disposed to think moisture is an essential condition of its manifestation. It must be confessed, however,

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that we know very little about the subject. A curious statement is made by Delile *(Delile Exam. de la Phospho. de l'Ag. de l'Oliv.* p. 8,*)* to the effect that *Agaricus olearius* did not give out its light during the day-time when placed in darkness. Tulasne regretted that he himself omitted to test the fact with the specimens he had under hand; but with regard to *Rhizomorpha* he asserts, that specimens he had seen luminous at night, when placed in the dark at mid-day gave no signs of luminosity.

There are many other undetermined problems connected with the subject, but those I have glanced at may be sufficient to show that a large field of enquiry lies before the student who will have the courage and perseverance to undertake the task; and if any amongst us is induced to do so, the object of this short paper will be answered.

THE NEW SCLEROTIUM DISEASE IN IRISH POTATOES.

This subject was introduced to the notice of the members by Dr. Bull.

It is to be regretted that no notes remain upon record, but this matter has been exhaustively treated, and fully illustrated by Mr. Worthington G. Smith in his *Diseases of Field and Garden Crops.* (See chap iv., page 17, et seg., of his small book, first edition.) This popular treatise and excellent guide, dedicated to "Dr. Bull, of Hereford, and the Officers and Members of the Woolhope Club," should be studied by every educated horticulturist and agriculturist, as well as by every member of the Woolhope Naturalists' Field Club.

A MONOGRAPH OF THE BRITISH HYPOMYCES.

[By Chas. B. Plowright.]

(With illustrations of all species, by Dr. M. C. Cooke, M.A., A.L.S.)

There are several points which render the members of this genus specially interesting to the mycologist, and which make it a promising field for the worker. In the first place, the nature of the matrices upon which the species grow fungi. *Hypomyces* are *inter alia* fungi, growing upon other fungi. These fungous hosts vary in nature and in quality very considerably. Some are living fungi, which afford the *Hypomyces* a home long ere they themselves have attained maturity; for example, *H. luteo-virens*, Fr., grows upon agarics. It has occurred near King's Lynn for three successive seasons, yet, although attention has been especially directed to this point, it has not, as yet, been possible to determine with certainty what the agaric is, for the simple reason that the *Hypomyces* attacks it before it appears above ground, and so alters its appearance, that beyond recognising the fact that it is an agaric, its genus, much less its species, cannot be

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determined. Prof. P. A. Karsten, however, has met with this *Hypomyces* in Finland, upon various species of *Lactarii*, and it is highly probable that, in the course of time, this observation will be confirmed in this country. More commonly, however, these parasites attack fungi which have attained, or even passed their maturity, as *H. chrysospermus*, *aurantius*, *rosellus*, &c. Some grow upon the fleshy *Agaricini* and *Boleti*, others upon the tough, coriaceous *Polyporei* and *Sterei*, while two species affect such ephemeral hosts as the *Myxomycetes* afford. But perhaps the most remarkable species grows, not upon the fungus itself, but upon the ground under or near where it has decayed, this decay being the result of the growth of an earlier stage of the *Hypomyces*. In other words the *Hypomyces*, in its conidial stages, first attacks the host fungus, and by causing its decay, generates the pabulum necessary for the nourishment and perfection of the higher form of fructification (ascigerous) of the *Hypomyces*, which is found a in stroma developed on the ground.

The genus *Hypomyces*, however, is interesting, not only from its fungicolous habit, but also from the numerous phases of existence through which many of its members pass. In the highest condition under which we meet with it, it is ascigerous, and belongs to the large order *Sphæriacei*, inasmuch as it has its sporidia enclosed in asci, and its asci enclosed in perforate perithecia. The perithecia are membranous, coloured often brightly, pierced at the apex by minute ostiola, and are, as a rule, seated upon a web of floccose mycelium, which is tolerably permanent, and has usually the same colour as the perithecia. The asci are, as a rule, octosporous, and take the form of an elongated cylinder. The sporidia are of two types, (1) either rather large, fusiform, normally uniseptate, and produced at either extremity into an acute point, or pointed appendage; or (2) they are small, oval, with blunt extremities, and, as a rule, uniseptate.

The second form of fructification consists of *Macroconidia* or *Chlamydospores*. These are large spores, having usually a thick, often echinulate or verrucose epispore, frequently globose, brightly coloured, and very abundant.

The third form of fructification, the *Microconidia*, or *Conidia* proper, are, on the contrary, small hyaline spores, often extremely abundant, born singly upon the tips of hyaline tubes, or concatenately. Many of them have been described as autonomous species of *Mucedenes*, under the genera *Botrytis*, *Verticillium*, *Dactylium*, &c.

All three states of every *Hypomyces* have not as yet been observed, either in this country or elsewhere. As a rule, the ascigerous condition is the least frequently encountered, but this is by no means always the case; perhaps, upon the whole, the microconidia are the most abundantly diffused.

M. Tulasne mentions two species of *Hypomyces* which have been found in this country, but which cannot, I think, be fairly included in this genus, as it is at present limited, viz. :—

Hypomyces miliarius and *H. tuberosus*. Both of these species have this in common, that they, while growing parasitically upon other fungi, develope sclerotia. They were both pointed out by M. Max Cornu, at Hereford.

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Hypomyces miliarius, Tul. This species consists of a thin white layer of mycelium running over the gills, and sometimes other superficial parts of various *Russulæ (R. emetica, fœtens*, and *adusta)*. From this mycelium are produced erect conidiophores, which bear abundant narrow ovate oblong conidia ·004–·013 mm. in length. Intermixed with the mycelium are innumerable small globose sclerotia.

Tulasne, Sel. Carp. Fung., III., p. 43, note. Saccardo, Mich., I., p. 287.

Hypomyces tuberosus, Tul., is a much larger plant than the preceding. The sclerotia are large, globose or irregular, whitish or pallid, and externally a good deal resembling those from which *Agaricus cirrhatus* is developed, but there is this very marked difference between these two sclerotia—those of the agaric, when cut across, are pale yellow within, while those of the so-called *Hypomyces* are reddish brown. My friend M. Cornu, last autumn, gave me some fresh sclerotia of the latter kind, which I placed in incisions in the stem of a specimen of *Lactarius vellereus* and kept under a bell-glass. In due course, the sclerotia developed a beautiful mould consisting of a central stem, which, in the course of a few days from its first appearance, grew to the height of 2 to 3 c.m., and gave off, at right angles, branches bearing oval hyaline spores. The branches were very numerous, nearly at right angles to the central stem, not arranged in whorls. The erect direction of the stem soon became lost, and the branches interlaced with those of other specimens, so that an intricate mass was formed, from which was developed a fresh crop of sclerotia.

Tulasne, Sel. Carp. Fung., III., p. 58, note. Saccardo, Mich., I., p. 287.

There remain two species of *Hypocrea* which, only after mature consideration, have been excluded from the present monograph, namely *H. alutacea* and *H. inclusa*, B. & Br. The former is a well-known plant which has been figured and described by various authors under the generic designations of *Hypocrea, Cordyceps, Claviceps, Sphæria*, and *Clavaria*. As usually found in this country, it bears a stronger external resemblance to the *Torrubiæ*, than to the members of any other genus. Its fructification, however, clearly shows its affinity to the *Hypocreæ*. Its asci contain eight uniseptate hyaline sporidia, which at maturity fall into two separate halves at the septum, so as to appear as sixteen globose sporidia arranged in a linear series.

M. Tulasne regards this species as an ally of the *Hypomyces*, and considers it parasitic upon *Clavaria ligula*. Now *Clavaria ligula* is not, properly speaking, an English species, for although within the last few years it has been recorded from Scotland, it has not as yet been met with south of the Dee. In searching for *Hypocrea alutacea*, some few years ago, near Hereford, Mr. C. E. Broome casually mentioned the fact that he frequently found it growing in company with *Spathularia flavida*, and since which time I have found it several times, but always associated with the *Spathularia*, except on one occasion. So intimate and pertinacious has this association been that I cannot doubt its parasitism. The other occasion, alluded to above, was near King's Lynn, when it occurred upon an old stump, and although I cannot recognize the host upon which it grew (any more

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than the agaric which harbours *Hypomyces luteo-virens*), yet I have no doubt as to the parasitic nature of this plant.

The younger specimens are whitish in colour, and only assume their alutaceous hue when the perithecia are developed. M. Tulasne (Sel. Fung. Carp., III., t. IV., f. 4) gives a figure of the conidia, which are globose hyaline bodies, born upon verticillate septate threads.

Hypocrea inclusa, B. & Br., is a species remarkable, both on account of its curious habitat as well as for its fructification; it is virtually an eight-spored *Hypocrea*, growing internally upon the hymenium of *Tuber puberulum*.

The following seventeen species of *Hypomyces* naturally fall into two groups, viz., those of which the ascigerous fructification is known, and those of which it is unknown. The former may further be divided into (A) those having larger acute sporidia, and (B) those with smaller obtuse sporidia.

ASCOSPORES KNOWN.

A.—Sporidia acute.

1 Hypomyces chrysospermus, Tul.
2 ,, asterophorus, Tul.
3 ,, lateritius, Tul.
4 ,, torminosus, Tul.
5 ,, rosellus, Tul.
6 ,, aurantius, Tul.
7 ,, ochraceus, Tul.
8 ,, Tulasneanus, Plow. and Cooke.
9 ,, luteo-virens, Tul.
10 ,, terrestris, Plow. and Boud.
11 ,, Broomeanus, Tul.

B.—Sporidia obtuse.

12 ,, Berkleyanus, Plow. and Cooke.
13 ,, aureo-nitens, Tul.
14 ,, violaceus, Tul.
15 ,, candicans, Plow.

ASCOSPORES UNKNOWN.

16 ,, Linkii, Tul.
17 ,, cervinus, Tul.

1. **Hypomyces chrysospermus**, *Tul. Conidia*, small, white, ovate or oblong, obtuse at both ends, sometimes contracted in the middle; ·01 to ·02 mm. long by ·005 to ·006 mm. wide.

Chlamydospores. Spherical, rough with warts, golden yellow, becoming yellow brown, very abundant; ·013 to ·02 mm. in diameter.

Perithecia. Numerous, crowded, upon and amongst the golden powder of the chlamydospores, ovoid, with a conico-attenuated apex; at first hyaline, then golden yellow, smooth; ·3 to ·32 mm. in height.

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Asci. Cylindrical, attenuated below; ·12 to ·2 mm. long by ·001 mm. wide.

Sporidia. Eight, elongated, lanceolate, hyaline usually, unequally uniseptate; ·021 to ·03 mm. long by ·006 mm. wide.

Hypomyces chrysospermus, Tul. Ann. Sc. Nat., Series IV., Vol. XIII. (1860), p. 16.
,, ,, Karsten Mycol. Fenn. II., p. 209.
,, ,, Sel. Fung. Carp. III., p. 49, t. VIII., f. 1-13.
,, ,, Fuckel Symb. Myc., p. 182.
,, ,, Berk. and Broome Ann. N. H., No. 1832.
,, ,, Phillips and Plow., Grev. VIII., p. 104.
,, ,, Saccardo Mich. I., p. 285.
,, ,, Mycol. Venet. sp. 124.

Chlamydospores:

Tubiporus sulphuratus. Paulet. t. 183, fig, 1, 2.
Reticularia chrysosperma Bull. t. 476, f. 4.
Mucor chrysospermus. Bull. t. 504, f. 1.
,, ,, Sow. t. 378, f. 13.
,, ,, With. IV., p. 370.
,, ,, Purton. II. and III., No. 1121.
Uredo mycophila. Alb. and Schw., p. 122.
,, ,, Pers. Obs. Myc., p. 16.
,, ,, Pers. Synop., p. 214.
,, ,, De Cand. Flor. Gall. II., p. 230
Sepedonium mycophilum. Nees Syst. der Pilze., p. 44, t. III., f. 38.
,, ,, Mart. Fl. Cryp. Erlang., p. 339.
,, ,, Link. Obs. I., p. 16.
,, ,, Willd. Sp. Plant. VI., p. 29.
,, ,, Corda Icones. IV., p. 7, t. III., f. 23.
,, ,, Grev. t. 198.
,, ,, Chev. Fl. Par., t. III., f. 16.
,, ,, Chev. Fung. et Byss., t. 16.
,, ,, Rabh. Exs. 184.
,, ,, Rabh. Cryp. Flor. I., p. 71.
Mycobanche chrysosperma. Pers. Champ. Com., p. 133.
,, ,, Wallr. Fl. Germ. II., p. 272.
Sporotrichum mycophilum. Spreng. Sys. Veg. IV., p. 549.
Sepedonium chrysospermum. Link. Obs. I., p. 29.
,, ,, Fries Sys. Myc., III., p. 438.
,, ,, Fries Sys., Veg. Sc., p. 497.
,, ,, Berk. Eng. Fl. V., pt. 2., p. 350.
,, ,, Tulasne Act. Heb. Ac. Science, 1855, p. 616.
,, ,, Berk. Outlines, p. 355.
,, ,, Cooke Hdbk., p. 619.
,, ,, Fckl. Exs., No. 141.
,, ,, Stevenson Mycol. Scot., p. 286.

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Sepedonium chrysospermum.		Berk. Cryp. Bot., pp. 298, 304, 306.
,,	,,	Kunze Exs. 223.
,,	,,	Bisch. f. 3806.
,,	,,	Bonord. Hdbk., t. 4, f. 103.
,,	,,	Karst. Exs. 387.

Common in the conidiferous state upon various Boleti, especially *B. scaber*, *chrysenteron*, *subtomentosus*, *badius*, and *edulis*. It also occurs on *Paxillus involutus*, and upon *Strobilomyces strobilaceus*. Tulasne records it upon *Scleroderma verrucosum*, *Octaviana asterosperma*, and *Melanogaster variegatus*.

The ascigerous state is much the most uncommon; it was found by the Rev. M. J. Berkeley at Coed Coch, and in Chapelton wood near Forres by the Rev. J. Stevenson and myself in September, 1879. The infected Boletus first shows signs of being affected with the parasite by producing upon its surface, at some point, a crop of microconidia. If it be examined in this stage, numerous mycelial tubes will be seen making their way downwards or towards the centre of the matrix. These penetrate with great rapidity into the substance of the Boletus. Immediately beneath the microconidia will now be found upon the same mycelium the macroconidia. They are at first almost colourless, but soon become faintly tinged with yellow, then golden. The whole fungus in a short time becomes reduced to a mass of golden powder, which falls to pieces on the gentlest touch. What the precise conditions are which favour the production of perithecia I have failed to discover beyond that the too rapid development of Chlamydospores must not take place.

PLATE 1. *a* Portion of a Boletus with the conidia growing in a white woolly mass upon its surface. Nat. size.
b Part of the same × 400.
c Microconidia × 400.
d Macroconidia × 400.
e Perfect fungus on Boletus. Nat. size.
f Perithecia × 20.
g Perithecium × 140.
h i Asci and sporidia × 400.
k Sporidia × 600.

2. **Hypomyces asterophorus**, *Tul.* *Conidia*, cylindrical, produced from the extremities of the branching mycelial tubes; ·01–·015 mm. long by ·0035 mm. wide.

Chlamydospores produced singly upon the lower and thicker portions of the mycelial tubes; spherical, rough with warts, appendiculate, eventually falling into a copious fawn-coloured powder; ·02 to ·025 mm. in diameter.

Perithecia formed in and by the effused mycelial tubes, crowded, sessile, spherico-ovoid, more or less elongated at the neck; with acute, pervious, ciliate ostiola; pale yellow brown, sub-hyaline; ·15 mm. high by ·07–·09 mm. wide.

Asci broadly ovate, abruptly attenuated below.

Sporidia narrowly lanceolate, curved, mucronate at either end, uniseptate, pale yellowish brown; ·025–·035 mm. long by ·006 mm. wide.

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Hypomyces asterophorus, Tulasne. Sel. Fungi Carp. Vol. III., p. 54, t. 9.
" " Fuckel. Symb. Myc., p. 181.
" " Karsten Myc. Fenn. II., p. 209.
" " Saccardo Mich. I., p. 285.

Conidia:

Elvella clavus. Schæff., t. 279.
" " Paulet., t. 190, f. 4.
Fungoidaster parvus, &c. Mich., p. 200, t. 82, f. 1.
Merulius lycoperdoides. De Cand. Fl. Fr., Vol. II., p. 128.
Onygena agaricina Schweintz Fung. Car. Super. p. 65.
Agaricus lycoperdonoides. Bull. t. 166 and t. 516, f. 1.
" " Sow. t. 383.
" " Pers. Synop., p. 325.
" " Pers. Mycol. Europ., Vol. III., p. 127.
Agaricus (Asterophora) lycoperdoides. Nees Syst. d. Pilze., p. 206, t. 24, f. 194.
Asterophora Linkii. Schrad. N. Jour. Bot., Vol. III., p. 17.
" " " Mag. Nat. Fr. z. Berlin, III. (1809), p. 33.
" lycoperdoides. Ditm. Sturm. t. 26.
" " Rabh. Exs. No. 235.
" agaricoides, lycoperdoides, physaroides, and trichoides. Fries. Obs. Myc. II., p. 367.
" agaricoides, lycoperdoides, and physaroides. Fries. Sys. Mycol. III., p. 205.
" lycoperdoides and trichoides. Fries. Sys. Veg. Sc., p. 446.
" agaricoides and lycoperdoides. Berk. Eng. Fl. Vol. v. pt. 2, p. 322. Wallr. Flora. Germ., pt. 2, p. 270.
" lycoperdoides and physaroides. Bonorden, p. 134, t. 11, f. 224.
Asterosperma agaricoides. Pers. Champ. Comes, t. I., p. 132 and 134.
Nyctalis asterophora. Fries Ep., p. 371. S. V. S., p. 312. Hymen., p. 463.
" " De Bary Bot. Zeit., t. 17 (1859), p. 385 and 397, t. 13, f. 1-11.
" " Berkeley Outlines, p. 217, Cryp. Bot., p. 305, 366.
" " Cooke Hdbk., p. 231.
" " Stevenson Mycol. Scot., p. 116.
" " Cooke and Quelet, p. 151.
" " Karst. Exs., 512.

Parasitic upon *Nyctalis parasitica*, certain years abundantly; at other times scarcely a specimen is met with.

The perithecia of this species of *Hypomyces* differ considerably from those of the other members of the genus. They are formed of very large polygonal cells,

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which become elongated and parallel where they form the ostiolum. The conidial state of this fungus has been known in this county since the time of Sowerby, but it was only in the month of September, 1880, that I was fortunate enough to meet with perithecia. Several specimens were then found in Hockering Wood, in company with the Rev. J. M. Du Port. Their development was carefully watched by placing them, attached to the matrix *(Russula nigricans)*, upon damp sand under a bell glass. The conidia specially affect the pileus of the *Nyctalis*, often so freely as to arrest the growth of the plant, and to cause it to assume the appearance of an *Onygena*. The microconidia are produced by the tips of the hyphæ, which break off in little cylindrical bodies. Lower down upon the same hyphæ the macroconidia are produced often in great profusion. The lowest portions of the hyphæ are dilated and convoluted, and it is by an intertwining of these convolute bases that the perithecia are produced, pl. 2 *d*. As was the case with *Hypomyces chrysospermus*, too free a production of macroconidia is unfavourable to the development of perithecia. These are most frequently found upon or inside the stem of the *Nyctalis*, but they are by no means of common occurrence.

PLATE 2. *a* Nyctalis bearing the parasite. Nat. size.
b Macroconidia × 400.
c Microconidia × 400.
d Perithecium in formation × 400.
e Perithecium × 40.
f Perithecium × 400.
g Asci and sporidia (after Tulasne) × 400.
h Sporidia × 400.

3. **Hypomyces lateritius**, *Tul.* *Conidia* minute, sphærical, colourless, ·0035 to ·007 mm. in diameter; borne upon awl-shaped filaments, produced by the thick web-like mycelium.

Perithecia minute, ovato-globose, nestling in the white abundant mycelium; apex smooth and slightly papillate, emergent.

Asci cylindrical, scarcely attenuated below; ·2 to ·25 mm. long by ·006 to ·007 mm. wide.

Sporidia eight; uniseriate, uniseptate, acuminate, lanceolate, hyaline; ·015 to ·02 mm. long by ·0035 to ·0045 mm. wide.

Hypomyces lateritius, Tulasne. Sel. Fung. Carp. III., p. 62, and II., p. 273, t. 30, f. 5.
,, ,, Ann. Sc. Nat., Ser. IV., 1860, p. 11.
,, ,, Fuckel Symb. Mycol., p. 182.
,, ,, Karsten Myc. Fenn. II., p. 211.
,, ,, Cooke Handbk., p. 779.
,, ,, Saccardo. Mich. p. 285.
,, ,, Plow. Exs., I., No. 5.
,, ,, Stevenson Myc. Scott., p. 359.
Merulius helvelloides. Sow., t. 402.
Hypolyssus ventricosus. Pers. Myc. Eur. II., p. 7.
Agaric délicieux, var. dénaturée. Secret. Myc. Helv. I., p. 567.

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Lapacendro infarinato. Venturi Stud. Myc., p. 40, t. 13, f. 122, 123.
Sphæria lateritia. Fries Sys. Myc. II., p. 338.
,, ,, Fries Elench. II., p. 66.
,, ,, Moug. and Nest. fasc. XIV., No. 1334.
,, ,, Currey Linn. Trans. (1858), p. 267, t. 46, f. 47.
,, ,, Kunze, Myc. Heft. II., p. 42.
,, ,, Berk. Eng. Fl. v., pt. II., p. 238.
Hypocrea lateritia. Fries Sum. Veg. Sc., p. 383.
,, ,, Mazer. Pl. Cryp. Gall. XVI., 776.
,, ,, Berk. Outlines, p. 383.

On the hymenium of *Lactarius deliciosus*. Whitfield and Merry-hill Common, near Hereford, 1874; Coed Coch, Oct., 1880.

This is quite distinct from *Hypomyces torminosus*, with which it seems to be confounded by some Continental fungologists. It is thicker, more fleshy, and, especially in the earlier stages, frosted over with white meal.

PLATE 3 A. *a* Lactarius deliciosus with its Hypomyces. Nat. size.
b Perithecia enlarged.
c Perithecium × 140.
d Asci and sporidia × 400.
e Sporidia × 800.

4. **Hypomyces torminosus**, *Tul.* *Perithecia* small, sphærical, depressed, honey-coloured, papillate, papilla darker; ·24 mm. in diameter; produced amongst the floccose subiculum, which varies in amount and colour.

Asci elongate, cylindrical; ·112 mm. long by ·006 to ·007 mm. wide.

Sporidia eight, uniseriate, uniseptate, lanceolate, acuminate, very pale yellow; ·018 to ·02 mm. long by ·004 to ·0045 mm. wide.

Hypomyces torminosus. Tul. Sel. Fung. Carp. III., p. 40.
,, ,, Cooke Hdbk., p. 779.
,, ,, Plow. Sph. Brit. II., No. 4.
Nectria torminosa. Mont. Syll., p. 225, No. 788.
Hypocrea floccosa. Fries Sum. Veg. Sc., p. 564.
,, ,, Berk. and Br. Ann. N. H., No. 593.
,, ,, Berk. Outl., p. 383.

On the hymenium of *Lactarius torminosus*. Kings Cliffe, M. J. B.; Dinmore hill, Oct., 1874, 1878, C. B. P.

At first forming a thin white floccose web upon the gills of the *Lactarius*, which gradually becomes pale yellow, then honey-coloured, and eventually, when the specimen dries, assuming a chocolate-brown hue.

PLATE 3 B. *a* Lactarius torminosus with its Hypomyces. Nat. size.
b Perithecia × 20.
c Perithecium × 140.
e Asci and sporidia × 400.
f Free sporidia × 800.

5. **Hypomyces rosellus**, *Tul.* *Conidia*: Flocci aggregate, branched, white, branchlets numerous, 3–6, verticellate, bearing terminal conidia, which are

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hyaline, cylindrico-oblong, obtuse; two or more, usually three, septate; ·025 to ·035 mm. long by ·01 to ·013 mm. wide.

Perithecia gregarious, emerging from a thin subiculum of an open texture, which is at first white, then rose-coloured; sphæroid-ovoid, with an obtuse or acute papilla; deep rose-red, variable in size.

Asci narrow, linear; ·15 mm. long by ·0065 mm. wide.

Sporidia eight; uniseriate, narrowly lanceolate; apiculate at both ends, straight or curved, nucleate or spuriously 1-3 septate, often subunequilateral, hyaline; ·022 to ·037 mm. long by ·005 to ·007 mm. wide.

Hypomyces rosellus. Tulasne Sel. Fung. Carp. II., p. 273, t. 30, f. 6-9; III., p. 45, t. 5 and t. 6, f. 1-18.
,, ,, Ann. Sc. Nat., 1860, p. 12.
,, ,, Karsten Myc. Fenn. II., p. 208.
,, ,, Saccardo Mich. I., p. 285.
,, ,, Stevenson Myc. Scot., p. 359.
,, ,, Cooke Handbk., p. 778, in part.
,, ,, Plow. Sph. Brit., III., No. 4.

Conidia:

Trichothecium agaricinum. Bonord, t. 5, f. 114.
,, candidum. Bonord, t. 8, f. 167.
Dactylium dendroides. Fries Sys. Myc. II., p. 441.
,, ,, Fries Sum. Veg. Sc., p. 491.
,, ,, Berk. Eng. Flor. v., pt. 2, p. 345.
,, ,, Berk. Outlines, p. 351.
,, ,, Cooke Hdbk., p. 778.
,, ,, Cooke Quek. Journ., 1870, t. 4.

Ascophore:

Sphæria rosea. Pers. Syn., p. 18.
,, ,, Fries Sys. Myc. II., p. 338.
Sphæria rosella. Alb. and Schw., p. 38, t. 7, f. 3.
,, ,, Fries Sys. Myc. III., p. 441.
,, ,, Nees., p. 318, t. 44, f. 362.
,, ,, Grev., Crypt. Fl. t. 138.
,, ,, Currey Linn. Trans. XXII., p. 314, t. 57, f. 3.
Nectria Albertini. Berk. and Broome Ann. N. H. No., 971, t. 17, f. 24a.
,, ,, Cooke Hdbk., p. 784.
Nectria rosella. Fries Sum. Veg. Sc., p. 388.
,, ,, Berk. Outlines, p. 393.
Hypomyces roseus. Fuckel Sym. Myc., p. 182.
,, ,, Saccardo Mich. I., p. 285.

Upon various decaying fungi, *Stereum hirsutum* most frequently, and upon the ground near where fungi have decayed.

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There are two varieties of this species, one with larger, pointed perithecia, as figured by Greville and by Albertini and Schweinitz; the other with smaller and more obtuse perithecia. The sporidia vary a good deal in size, as does the colour of the subiculum, which is sometimes nearly absent. Sometimes it is almost white, but mostly rose-coloured, with a whitish circumference. Fuckel's *H. roseus* does not seem to differ from the type species except in the size of the sporidia. This species is totally distinct from the species pointed out by Messrs. Berkeley and Broome in the *Annals of Natural History*, No. 971, and described in this monograph as *Hypomyces Berkleyanus*.

PLATE 4. *a* Fungus nat. size.
b Perithecia × 14.
c Perithecium × 120.
d Conidia × 400.
e Asci and sporidia × 400.
f Sporidia × 800.

6. **Hypomyces aurantius**, *Tul.* *Conidia:* Mycelium creeping, branched, septate, white (becoming orange), sending up erect branched, verticillate, conidiiferous threads, which bear upon their apeces ovate or obovate, hyaline, unequally uniseptate, slightly constricted conidia ·016 to ·018 mm. long by ·008-·01 mm. wide.

Perithecia springing from a more or less abundant effused, floccose, ochraceous subiculum, which is often white circumferentially, crowded, subconfluent, sphærical, with a conoid-attenuate apex, golden yellow or orange, ·3 mm. in diameter.

Asci cylindrical; ·11 to ·14 mm. long by ·006 mm. wide.

Sporidia eight; uniseriate, linear lanceolate, acute, often apiculate at either end; uniseptate or bipartite; hyaline, curved; ·015 to ·024 mm. long by ·004 to ·006 mm. wide.

Hypomyces aurantius.	Tulasne Sel. Fung. Carp. III., p. 43.
,, ,,	Fuckel Sym. Myc., p. 183.
,, ,,	Cooke Hdbk., p. 777.
,, ,,	Saccardo Mich., I., p. 285.
,, ,,	Stevenson Myc. Scot., p. 359.
,, ,,	Plow. Sph. Brit., I., No. 4.
Sphæria aurantia	Faies Sys. Myc., II., p. 440.
,, ,,	Pers. Syn., p. 68.
,, ,,	Pers. Icones et Des., t. 11, f. 4.
,, ,,	Nees., f. 362.
,, ,,	Alb. and Schw., p. 35.
,, ,,	Schw. Fung. Car. Sup., No. 170.
,, ,,	Currey Linn. Trans. t. 57, f. 6.
,, ,	Berk. Eng. Flor. v., pt. 2, p. 259.
Sphæria aurantiacea.	Gray Nat. Arr. I., p. 526.
Sphæria aurea.	Grev., Crypt. Fl. t. 47.
Nectria aurantia.	Fries Sum. Veg. Sc., p. 388.
,, ,,	Berk. Outlines, p. 393.

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On various *Polyporei* and the tougher *Agaricini*, *Polyporus squamosus*, *versicolor*, *adusta*, &c.; also on *Panus torulosus*, Reffley Wood, King's Lynn, Nov., 1879.

This species varies very much in the amount and colour of the subiculum. Sometimes this is nearly absent, it being invisible to the naked eye. The perithecia are then often crowded together in clusters, as Greville's figure (t. 47) represents. At other times the subiculum spreads widely, producing only here and there a few scattered perithecia. Some of Greville's specimens of *Cryptosphæria aurantia* (t. 78) are undoubtedly this species.

PLATE 5. *a* Conidia on an old Polyporus. Nat. size.
b Conidia × 400.
c Hypomyces on Panus torulosus. Nat size.
d Perithecia × 20.
e Perithecium × 140.
f Asci and sporidia × 400.
g Sporidia × 800.

7. **Hypomyces ochraceus**, *Tul.* *Conidia:* Tufts effused, woolly, white; flocci, erect, septate, pellucid; branches and branchlets subulate, verticillate, patent; conidia diaphanous, ovate, obovate, or oblong, straight, usually simple, sometimes uniseptate; ·05-·06 mm. long by ·004-·006 mm. wide.

Chlamydospores produced by the deeper and larger flocci in linear series of 2-4; each chlamydospore is globose, ·02-·03 mm. wide, slightly rough, at first white, becoming dirty or vinous-red.

Perithecia crowded, roundish, yellowish, universal, with a short, thick, obtuse exserted mouth, seated upon a subiculum, which is at first white, then straw-coloured, ochraceus, and yellow.

Asci linear, cylindrical; ·025-·03 mm. long by ·0065 mm. wide.

Sporidia eight; oblong-lanceolate, uniseptate, constricted, mucronate at each end: ·035 mm. long by ·0065 mm. wide.

Hypomyces ochraceus. Tul. Sel. Fung. Carp. III., p. 41, t. 6, f. 19-20, t. 7.
,, ,, Tul. Ann. Sc. Nat., 1860, p. 12.
,, ,, Cooke Hdbk., p. 777.

Conidia:

Mucor dendroides. Bull, t. 504, f. 9.
Botrytis agaricina. Link Obs. p. 15; Sp. Plant, VI., p. 54.
,, ,, Ditmar, Sturm. Fl. t. 51.
,, ,, Grev. Crypt. Fl. t. 126.
, Pers. Myc. Europ. I., p. 34.
Botrytis dendroides. Pers. Myc. Europ. I., p. 34.
Verticillium agaricinum. Corda Icones, II., p. 15, t. x, f. 68.

Chlamydospores:

Blastotrichum puccinoides. Preuss Sturm., XXV., t. 11.

Ascophore:

Sphæria ochracea. Pers. Syn., p. 18.

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Sphæria ochracea. Pers. Mycol. Europ. I., t. 1, f. 1-2.
Cryptosphæria aurantia. Grev. t. 78.

I have never met with this species, which seems more inclined to affect the fleshy Agaricini. Tulasne records it upon *Russula emetica* and *adusta*. Ditmar's figure of the conidia is upon a *Russula*, as well as Greville's figure of the conidia (t. 126), and of the perithecia (t. 78). It is only right, however, to state that some of Greville's specimens now extant in the Kew Herbarium are clearly *H. aurantius;* but *H. aurantius* was never known by me to occur upon a *Russula*. In the Edinburgh Herbarium, there is a specimen upon some Agaric which looks very like *H. torminosus*.

PLATE 6. *a* Hypomyces. Nat. size.
b Perithecia × 15.
c Perithecium × 60.
d Conidia × 400.
e Asci and sporidia × 400.
f Free sporidia × 800.

8. **Hypomyces Tulasneanus**, *Plow.* *Conidia* hyaline, oval, smooth, borne singly on the end of the branches of the mycelium; ·007–·015 mm. long by ·005–·006 mm. wide.

Chlamydospores large, yellow, narrowly oval, with an attenuated apex, attached at the base to the dilated extremity of a hyaline mycelial tube; ·016–·02 mm. long by ·01 mm. wide.

Perithecia small, ovato-globose, with a rather obtuse ostiola, which emerge from a dirty, yellowish green, thin subiculum; 0·25 mm. long by ·02 wide.

Asci elongate, cylindrical, ·12–·15 mm. long by ·01 mm. wide.

Sporidia eight, hyaline, lanceolate, usually simple, ·02–·025 mm. long by ·008 mm. wide.

Hypomyces luteo-virens, *Tul.*	Sel. Fung. Carp. III., p. 57, t. 8, f. 15–16.
,, ,,	Cooke Hdbk., p. 778.
Sphæria luteo-virens	Fries Sys. Myc. II., p. 339, in part.
Hypocrea luteo-virens	Fr. Sum. Veg. Sc., p. 383, in part.
,, ,,	Berk. and Broome Ann. N. H., No. 594.
,, ,,	Currey Linn. Trans. XXII., t. 46, f. 53.

On Boletus, Laxton, M. J. B. On Boletus, Mattishall, Sep., 1880, C. B. P.

This species is quite distinct from *H. luteo-virens* of Fries. It is much less brightly coloured, has very distinct chlamydospores, and affects *Boleti*.

PLATE 7, FIG. 1. *a* Boletus infested with the Hypomyces. Nat. size.
b Perithecium × 20.
c Perithecia × 140.
d Chlamydospores × 400.
e Asci and sporidia × 400.
f Sporidia × 800.

9. **Hypomyces luteo-virens**, *Fries.* *Conidia* oval, hyaline, born on the tips of hyaline, verticillate, trivaricately branched tubes. Stroma, a widely effused, thin tomentum, at first bright egg-yellow, becoming greenish, then almost black.

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Perithecia minute, crowded, ovoid or spherical, with a conical apex. Emergent, pallid, the free portion becoming brown or nearly black; ·38 mm. high by ·3 mm. wide.

Asci cylindrical, ·16 mm. long by ·007 to ·008 mm. wide.

Sporidia eight, uniseriate, elongato-elliptic, acute, straight, mucronate at either end, greenish or yellowish, hyaline, simple, ·628 to ·03 mm. long by ·005 to ·006 mm. wide.

Hypomyces viridis.	Berk. and Broome Ann. N. H., No. 1101.
,, ,,	Karsten. Myc. Fenn. II., p. 211.
,, ,,	Saccardo Mich. I., p. 286.
,, ,,	Phillips and Plow. Grev. VIII., p. 104, t. 130, f. 1 *(a-e)*.
Sphæria viridis.	Alb. and Schw. Consp., p. 8, t. 6, f. 8.
,, luteo-virens.	Fries Sys. Myc. II., p. 339.

On various Agarics, especially *Lactarii*. Ray's Plantation, South Wootton, 1878-9-80, C. B. P.

This is a very marked species, which I have had one opportunity of watching through various stages of its development. It attacks the fungus (usually as *Lactarius*) before it appears above ground. In this early state the agaric looks as if it had been dipped in the yoke of an egg. So completely were my specimens infected, that it was impossible to identify the host beyond being an agaric. In a short time the yellow colour darkens and becomes a dirty cinerous green, more or less dark in tint. The affected agaric usually increases *pari passu* with the *Hypomyces*, and does not tend to putrifaction to any abnormal degree.

PLATE 7, FIG. 2. *a* Portion of Lactarius with the Hypomyces. Nat. size.
b Perithecia, enlarged.
c Perithecium × 140.
d Sterile threads of conidia ×1400.
e Asci and sporidia × 400.
f Sporidia × 800.

10. **Hypomyces terrestris**, *Plow. & Boud. Conidia* parasitic upon Agarics, consisting of branched hyaline septate tubes, bearing at their extremities oval or pyriform conidia, which are filled with transparent, granular endochrome; ·025 to ·03 mm. long by ·01 mm. wide.

Stroma at first a mere web of white arachnoid threads, spreading over the ground, which gradually becomes thicker and consolidates into *Corticium*-like patches of from 1 to 2 c.m. in diameter, of a pale flesh-colour.

Perithecia sub-globose, at first immersed in the stroma, then nearly half free, reddish in colour; ·3 mm. in diameter. Ostiola conoid red.

Asci cylindrical; ·15 to ·2 mm. long by ·015 mm. wide.

Sporidia eight, fusiform, acute, sometimes appendiculated, hyaline, uniseriate; ·03 to ·04 mm. long by ·008 to ·01 mm. wide.

Hypomyces terristris, *Plow and Boud.* Grevillea VIII., p. 105, pl. 130, f. 2.

On the ground, beneath or in close proximity to the place in which the conidiiferous agaric has decayed.

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North Wootton, 1874-80. Leziate, 1880.

The Conidia, in this county, occur most frequently upon *Lactarius rufus*. During the process of decay thus engendered in the agaric, the stroma of the Hypomyces makes its appearance upon the ground beneath it, which in due time produces perithecia and sporidia. If, however, the conidiiferous agaric be by any accident removed while the development of the *Hypomyces* is in its earlier stages, ascigerous fructification is not produced. M. Boudier has sent me this fungus from Montmorency.

PLATE 8. *a* Fungus nat. size.
b Perithecia enlarged.
c Perithecium × 100.
d Conidia × 400.
e Asci and Sopridia × 400.
f Sporidia × 800.

11. **Hypomyces Broomeianus**, *Tul.* *Conidia* hyaline, oval; borne on the extremities of branched, septate, hyaline tubes, which form a subiculum around the perithecia; ·005 to ·007 mm. in length.

Perithecia ovate, acute, clad with a dense short wool, except immediately around the ostiola; ·25 to ·5 mm. high by ·18 mm. wide.

Asci linear, cylindrical; ·13 to ·14 mm. long by ·0035 mm. wide.

Sporidia eight; linear, lanceolate, straight, uniseptate; ·013 mm. long by ·0035 mm. wide.

Hypomyces	Broomeianus.	Tulasne Sel. Carp. Fung. III., p. 108.
,,	,,	Berk. and Broome Ann. N. H., No. 1175, t. 5, f. 3.
,,	,,	Cooke Hdbk., p. 778.
,,	,,	Plow. Sph. Brit. III., No. 5.
,,	,,	Saccardo Mich. I., p. 286.
Hypocrea	luteo-virens.	Berk. and Broome Ann. N. H., No. 1101.
,,	,,	Rabb. Exs., No. 751.

Batheaston, Nov. On *Polyporus annosus*, C. E. B.; Castle Rising, Nov., C. B. P.

This minute species seems to be confined to the above Polyporus, over dead and living specimens of which it runs indiscriminately.

PLATE 9. *a* Portion of Polyporus annosus with its parasite. Nat. size.
b Perithecia enlarged.
c Perithecia × 140.
d Conidia highly magnified.
e Asci and sporidia × 400.
f Sporidia × 800.

12. **Hypomyces Berkleyanus**, *Plow. & Cooke.* *Perithecia* seated upon a delicate rose-coloured or pallid subiculum, globose or ovate, with a minute ostiolum; ·32 mm. in diameter.

Asci cylindrical; ·01 to ·012 mm. long by ·007 to ·008 mm. wide.

Sporidia eight; oval or oblong, blunt at both ends, hyaline, uniseptate, uniseriate; ·008 mm. long by ·003 to ·004 mm. wide.

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Hypomyces rosellus. Cooke Hdbk., p. 778, in part.
Nectria rosella. B. & Br. Ann. Nat. Hist., No. 971, t. 17, f. 24b.

Downton, Herefordshire, Oct., 1878. On dead *Stereum hirsutum*. Sandringham, Nov., 1878. On dead wood, covered by some *Corticium*.

This species is far more uncommon than *H. rosellus*, from which it is instantly distinguished by its much smaller, obtuse, Nectria-like sporidia.

PLATE 10, FIG. 1. *a* Hypomyces on old Stereum.
b Perithecia.
c Perithecium × 100.
d Asci and sporidia × 400.
e Free sporidia × 800.

13. **Hypomyces aureo-nitens**, *Tul.* *Conidia* minute, hyaline, oval; ·003 to ·004 mm. long by ·002 mm. wide; in short chains, borne terminally upon tassel-like heads.

Perithecia globose, obtuse, shining golden yellow, granular, not distinctly cellular, small; ·3 mm. high, ·25 mm. wide, nestling amongst the golden subiculum.

Asci linear; ·07 mm. long by ·005 mm. wide.

Sporidia eight; uniseriate, ovato-oblong, uniseptate, constricted, acute at either end; ·01 to ·013 mm. long by ·003 mm. wide.

Hypomyces aureo-nitens. Tulasne Sel. Carp. Fung. III., p. 64.
,, ,, Saccardo Mich. I., p. 258.

On *Stereum hirsutum*. Pwllycrochon Wood, North Wales, 11th Oct., 1880.

PLATE 11. *a* Hypomyces on hymenium of an old Stereum. Nat. size.
b Tuft of Conidia × 40.
c Conidia × 400.
d Apex of thread conidia × 800.
e Perithecia × 15.
f Perithecium × 140.
g Asci and sporidia × 400.
h Free sporidia × 800.

14. **Hypomyces violaceus**, *Tul.* *Conidia:* Mycelium very delicate, white, branching divaricately, bearing hyaline, oval, or linear oblong conidia, which are sometimes septate, straight, or curved; ·01 to ·022 mm. long by ·005 to ·007 mm. wide.

Chlamydospores broadly ovate, obtuse at both ends, smoky-brown; ·023 to ·029 mm. long by ·016 to ·022 mm. wide.

Perithecia globose, very small, with obtuse ostiola, emergent, purplish violet.

Asci narrow, linear; ·055 to ·06 mm. long by ·004 mm. wide.

Sporidia eight; very small, oblong, obtuse at either end, straight or slightly unequal, simple or uniseptate, hyaline; ·006 to ·007 mm. long by ·002 to ·003 mm. wide.

Hypomyces violaceus. Tulasne Sel. Carp. Fung. III., p. 60.
,, , Ann. Sc. Nat., Ser. 4, XIII., 1860, p. 14.
,, Fuckel Sym. Myc., p. 183.

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Hypomyces violaceus.	Karst. Myc. Fenn. II., p. 211.
,, ,,	Karst. Exs. 270, 379.
,, ,,	Saccardo Mich. I., p. 286.
,, ,,	Phillips and Plow., Grev. VIII., p. 104.
Sphæria violacea.	Schm. in Herb. Kunze.
,, ,,	Fries Sys. Myc. II., p. 441.

On *Œthalium septicum (Fuligo varians)* in an old sawpit at Cawdor Castle, N.B., Sept., 1879.

PLATE 12, FIG. 1. *a* Hypomyces on Œthalium. Nat. size.
b Perithecia.
c Perithecium × 100.
e Asci and sporidia × 420.
f Free sporidia × 800.
g Chlamydospores.
h Conidia.

15. **Hypomyces candicans**, *Plow.* *Perithecia* globose, gregarious, upon and surrounded by a floccose, white mycelium, woolly except the ostiolum, which is naked, subhyaline; ·2 mm. high by about ·15 mm. wide.

Asci cylindrical, rarely subclavate; ·05 to ·06 mm. long by ·003 to ·005 mm. wide.

Sporidia oblong, oval, blunt at both ends, rarely uniseptate, binucleate, sometimes very highly constricted at the septum, generally uniseptate; ·008 mm. long by ·003 mm. wide.

On some *Myxogaster*. Leziate, Aug., 1880; Bathford Down, Oct., 1880.

PLATE 12, FIG. 2. *k* Hypomyces candicans. Nat. size.
i Group of Perithecia, enlarged.
k Perithecium × 80.
l Asci and sporidia × 400.
m Sporidia × 800.

16. **Hypomyces Linkii**, *Tul.* *Conidia* ovate, oblong, or cylindrical, simple, rarely bilocular; ·01 to ·02 mm. long by ·007 mk. wide; smooth, colourless, borne singly on the ends of the branches of the mycelium.

Chlamydospores spherical, rose-coloured, verrucose, subtransparent; ·03 mm. in diameter; borne on the swollen end of a floccus.

Perithecia unknown.

Hypomyces Linkii.	Tulasne Sel. Fung. Carp. III., p. 44.
,, ,,	Tulasne Ann. Sc. Nat., 1860, p. 16.
,, ,,	Saccardo Mich. I., p. 284.
,, ,,	Fuckel Symb. Myc., p. 182.
Mycogone rosea.	Link. Obs. I., 16; Berl. Mag. III., 1809, p. 18; Sp., p. 29.
,, ,,	Willd. Sp. Plant VI., p. 29.
,, ,,	Chev. Fung. et Byss, t. 15.
,, ,,	Tulasne Act. Heb. Ac. Science, 1855, p. 616.
,, incarnata.	Pers. Myc. Europ. I., p. 26.
Sepedonium roseum.	Fries Sys. Myc. III., p. 438.
,, ,,	Fries Sum. Veg. Sc., p. 497.

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Sepedonium roseum.	Berk. Eng. Fl. v., Pt. 2., p. 351.
,, ,,	Berk. and Broome N. H., No. 132.
,, ,,	Berk. Outlines, p. 355.
,, ,,	Cooke Hdbk., p. 620.
,, ,,	Stevenson Myc. Scot., p. 286.
Mycobanche rosea.	Wallr. Fl. Cryp. Germ., p. 273.
Puccinia mycogone.	Corda. Icones I., p. 6. III., f. 99.

On *Agaricus rubescens*, Dr. Cooke; on the stem of a decaying *Boletus*, North Wootton, 1880, C. B. P.

Tulasne's specimens occurred on *Ag. rubescens* and *A. rimosus* in the neighbourhood of Paris.

PLATE 10, FIG. 3. *a* Agaricus rubescens attacked with Hypomyces. Linkii. Nat. size.
b Microconidia × 400.
c Macroconidia × 400.

17. **Hypomyces cervinus**, *Tul.* *Conidia* hyaline, ovate or lanceolate-oblong, simple or rarely uniseptate, borne on the ends of the filaments in a densely fasciculate manner, or sometimes sub-solitary; ·013–·016 mm. long by ·003 to ·0035 mm. wide.

Chlamydospores nearly globose, rough, fawn-coloured, borne singly on the ends of the flocci, which are dilated at their extremities.

Perithecia unknown.

Hypomyces cervinus.	Tulasne Sel. Fung. Carp. III., p. 51.
,, ,,	Tulasne Ann. Sc. Nat., 1860, p. 16.
,, ,,	Fuckel Sys. Myc., p. 182.
,, ,,	Saccardo Mich. I., p. 285.
Mycogone cervina.	Ditmar Sturm. I., p. 107, t. 53.
,, ,,	Pers. Mycol. Europ. I., p. 26.
,, ,,	Link. Sp. Plant VI., p. 30.
,, ,,	Berk. Introd., p. 304.
,, ,,	Rabh. Exs., 672.
Racodium mycobanche.	Pers. Myc. Europ. I., p. 72.
Sepedonium cervinum.	Fries Sys. Myc. III., p. 439.
Mycobanche cervina.	Wall. Fl. Germ. II., p. 273.
Puccinia cervina.	Corda. Icones III., p. 4, t. 1, f. 12.
Sporotrichum fungorum.	Corda. Icones III., p. 4, t. 1, f. 12.

On *Morchella esculenta*, Castle Rising, 1871; on *Peziza acetabulum*, May, 1872, C. B. P.; on *Peziza macropus*, Sufton Court, Hereford, Oct., 1878, M. C. C.

At first appearing as a white floccose spot, which soon developes the fawn-coloured chlamydospores towards the centre in great profusion, so that in a very short time the affected fungus looks as if it had been dusted with snuff.

PLATE 10, FIG. 2. *a* Peziza acetabulum attacked by Hypomyces cervinus. Nat. size.
b Microconidia × 400.
c Macroconidia × 400.

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REPORT ON THE EXHIBITION OF APPLES AND PEARS AT HEREFORD.

THE Woolhope Naturalists' Field Club do not confine their labours to the study of fungi, but, as most of our readers know, they have for some years been collecting information on the subject of Apples and Pears, and have enriched the literature of our country by three annual parts of an important publication, to which we have frequently referred—the *Herefordshire Pomona*. Since the issue of the first part, the scope of the undertaking has been greatly enlarged, and instead of merely illustrating the local fruits of their own county, the Club has now undertaken the much greater work of figuring and describing the principal Apples and Pears which are grown in various parts of the country. To help them in this work they have of late years held an exhibition of these fruits in the autumn, and have availed themselves on these occasions of the typical specimens of Apples and Pears brought together in competition for prizes for the purposes of their *magnum opus*. The exhibition for the current year took place at Hereford on Wednesday last, the 27th October. Nearly 2000 dishes of fruit were exhibited, and the greater portion of the exhibits were of the highest possible excellence.

The exhibition has for its objects :—

1.—To encourage the growth of valuable fruit in place of worthless varieties.
2.—To name fruits unknown to the exhibitor.
3.—To afford information to the Committee, and
4.—To provide characteristic specimens for illustration in the *Herefordshire Pomona*.

The arrangements of the exhibition were carried out, as on previous occasions, by Mr. H. C. Moore, Honorary Secretary, ably assisted by Mr. D. R. Chapman, Librarian.

The prize list was divided into several classes. Division I. was set apart for "professional" exhibitors, and was "open to all, and from anywhere." Class 1 was for a collection of dessert Apples. The prizes were awarded as under :—1st, Mr. Lewis Killick, Maidstone ; 2nd, Mr. John Watkins, Wisteston ; 3rd, Mr. J. Griffiths, Tillington. Mr. Killick's collection consisted of twenty-eight dishes, all good, several handsome and highly-coloured, and the whole as good an exposition of the dessert resources of our best orchards as any one need wish to see. The following were the kinds in this collection :—Duchess of Oldenburg, Worcester Pearmain, Blenheim Orange, Golden Knob, Mabbott's Pearmain, Aromatic Russet, Cox's Orange Pippin, Yellow Ingestre, Borden Pippin, Hubbard's Pearmain, Ribston Pippin, King of the Pippins, Dungay, Sturmer Pippin, Duchess of Gloucester, Golden Russet, Royal Russet, Court Pendu Plat, Wyken Pippin, Wanstall, Mannington Pearmain, Lady Derby, Bordeaux Reinette, Sharp's Pippin, Scarlet Nonpareil, Margil, Court of Wick, and Fearne's Pippin. Among other Apples shown in this class, there were good dishes of Peasgood's Nonsuch,

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Summer Queening, Summer Strawberry, Downton Pippin, Scarlet Crofton, and Cornish Aromatic.

Class 2 was for a collection of culinary Apples. Mr. Killick was 1st with thirty-four dishes, all large, handsome, excellent fruits. The kinds were:—Northern Greening, French Crab, Wellington, Siely, Tower of Glamis, Ecklinville Seedling, Yorkshire Greening, Cox's Pomona, Lord Derby, Woodcock, Lord Suffield, Royal Russet, Golden Noble, King of the Pippins, White Apple, Lucombe Seedling, Hoary Morning, Bedfordshire Foundling, Loddington Seedling, Blenheim Orange, Golden Spire, Winter Queening, French Royal, Hanwell Souring, Beauty of Kent, Mère du Ménage, Warner's King, Queen Charlotte, Cullen, Graham Gooseberry Pippin, Norfolk Beefing, New Hawthornden, and Winter Monarch. Mr. Watkins was 2nd, and Mr. John Barnes of Gloucester, 3rd.

Class 3 was for a collection of dessert Pears. The 1st prize was awarded to M. Benoit, Havre, for fifty-two varieties, all well-grown specimens, large and handsome, and including many kinds not common in this country. Mr. H. Moorman, Cheltenham, was 2nd, and Mr. J. Barnes, 3rd. In Class 4 (collection of culinary Pears) Mr. Barnes was 1st.

Division II.—Classes 5 to 11 were for amateurs. Class 5, collection of dessert Apples.—1st, Sir Henry Scudamore Stanhope, Bart., Holme Lacy; 2nd, Mr. J. Pitt, Bosbury; 3rd, Mr. H. Jenkins, Canon Pyon. Class 6, culinary Apples.—1st, Sir H. S. Stanhope, Bart.; 2nd, Mr. H. Ward, gr. to Lady Emily Foley, Stoke Edith; 3rd, Mr. H. Higgins, Thinghill, Hereford. Classes 7 and 8, collections of Nonpareils and Russets respectively.—No exhibits. Class 9, collection of dessert Pears.—Sir H. S. Stanhope, Bart., 1st, with a superb collection of twenty-four dishes. Every fruit was a perfect typical specimen. This was, taken altogether, the most interesting collection in the exhibition. The whole of these pears, we were informed, were grown on the cordon trees at Holme Lacy, of which an interesting account is given by Sir H. S. Stanhope in the second part of the *Herefordshire Pomona*. The following is a list of the kinds in this collection:—Doyenné Gris, Easter Beurré, Beurré Bachelier, Glou Morceau, Beurré d'Aremberg, Doyenné Blanc, Doyenné d'Alençon, Duchesse d'Angoulême, Beurré Diel, Triomphe de Jodoigne, Beurré Superfin, Beurré Sterckman, Van Mons, Zéphérin Grégoire, Beurré Clairgeau, Doyenné du Comice, Doyenné Boussoch, Columbia, Marie Louise, Duchesse d'Orleans, Monarch, Beurré Bosc, General Todleben, Joséphine de Malines.

Class 10 was for smaller collections of dessert Pears.—1st, Sir H. S. Stanhope, Bart.; 2nd, Mr. J. Parker, gr. to Mrs. Evans, Moreton; 3rd, Rev. C. H. Bulmer, Credenhill.

Class 11, collection of culinary Pears.—1st, Mr. F. Taylor, gr. to Mr. H. B. Strangways, Sherdington; 2nd, Sir H. S. Stanhope, Bart.

Classes 12 to 29 constituted Division III., each being for single dishes of, in some instances, named kinds of Apples and Pears, which elicited an interesting competition, and others for Apples "for present flavour," Pears "for present

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flavour," culinary Apples and culinary Pears for size, weight, and quality. Cox's Orange Pippin and Margil were equal 1st for flavour; Thomson's Seckle and Fondante d'Automne being ranged in the order named for the like quality. The heaviest dish of five Apples (Warner's King) weighed 7lb. 3oz.; the heaviest Apple (Gloria Mundi), 1lb. 12oz.; the heaviest dish of five Pears (Uvedale's St. Germain) 7lb. 14oz.; the heaviest Pear (one of the same kind) 1lb. 12oz.

Division IV. (vintage fruits) consisted of six Classes, most of which were well filled, the cider Apples and perry Pears of the district being pronounced by the judges very good; those from Devonshire, though larger, were not regarded as of equal quality for making high-class cider and perry.

The cottagers' classes (36 to 39) constituted Division V. and were very fairly filled.

Dr. Hogg, L.L.D., &c., London, and Mr. A. F. Barron, from the Royal Horticultural Gardens, Chiswick, were the judges in all the classes save those in Division IV. (vintage fruit), the exhibits in which were adjudicated upon by the Rev. C. H. Bulmer, assisted by Mr. G. H. Piper, of Ledbury.

Messrs. Cranston and Co. (Limited) showed a very fine collection of Apples, &c., not for competition. Messrs. R. Smith and Co., Worcester, showed some highly-coloured specimens of the Worcester Pearmain. Another collection of Apples, &c., not for competition, was exhibited by the Midland Counties' Fruit, &c., Co. (Limited), Worcester. *Philanthes.*—The *Gardeners' Chronicle*, October 30th, 1880.

ADDRESS BY THE RETIRING PRESIDENT, J. H. KNIGHT.

[Delivered at the Annual Meeting, April 19th, 1881.]

THE present meeting brings to a close my year of office as President of your Club, and, in accordance with your rules, it is now my duty to make some remarks upon our proceedings during the year. Before I proceed to do that, I feel I ought to make some apology to you for the very inefficient way in which I have been able to perform the duties devolving upon your President. It was not from any merit or special qualification of my own that I was requested to take that office—it was intended by you as a compliment and a token of good feeling towards the city whose Mayor and chief magistrate I had then the honour to be. I felt it my duty to accede to your request that I would become your President, and thus to give a practical proof that I, in common with my fellow-citizens, had a most friendly appreciation of the great and valuable services rendered by your Club, of which our city may well be proud.

I take this opportunity of expressing my warm thanks for the kind assistance I have received from your members generally, and will now proceed to review our year's proceedings.

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The first field meeting of the Club was held on Thursday, May 20th, when, by the kind invitation of the President of the Malvern Naturalists' Field Club, a joint excursion to the southern part of the Malvern Hills was arranged. The weather, fortunately, proved very fine. The members of this Club went by rail to Ledbury, and in carriages from thence through Eastnor Park, and by the Ridgeway to the Wind's Point, pausing by the way to contemplate the well-known Mistletoe Oak in Eastnor Park.

At the Wind's Point, the members of our Club were met and welcomed by those of the Malvern Club. An examination of the trenches of the Herefordshire Beacon being the first object, the ascent was commenced under the direction of Mr. Lines. After reaching the summit of the castrametation, and examining it, a descent was made into the deep fosse surrounding the citadel, where Mr. Lines having expanded a large and elaborate map of the trenches and earthworks, prepared by himself with great care, proceeded to read a paper containing his ideas as to the formation of the camp, its age, and its occupants.

The PRESIDENT of the Malvern Club (Mr. G. H. Piper), who had, in the preceding autumn, with unremitting and valuable personal efforts initiated and carried out a course of research by digging out the whole citadel from end to end, down to its rock base, then read a learned and exhaustive paper on "The Grand Castrametation," and quoted the various opinions of antiquaries thereon—the result of Mr. Piper's remarks was that in his opinion the fortification of the hill was the work of the early Britons, and that it was occupied and defended in Roman times, and against the Roman power. Afterwards the Romano-Britons may have garrisoned it.

This paper was followed by some very interesting remarks of Mr. E. Lees, who expressed a different view, and said that in his opinion, the occupation of the Herefordshire Beacon as a fortress of defence was subsequent to Roman times, and that such a stupendous system of ramparts and trenches could scarcely have been formed for a mere temporary purpose, but must have been garrisoned whenever an invading force was present. Mr. F. G. H. Price, of London, gave a detailed account of all the articles and relics that had been found in the excavations made in the preceding autumn, at the summit of the Beacon camp.

The members then partook of a bread-and-cheese luncheon which the Malvern Club had kindly provided on the summit of the Beacon, which was thoroughly enjoyed, and suitable thanks were given by your President to the Malvern Club for their hospitality. The party then descended to Clutter's Cave, to the Silurian Pass, and along the western base of Swinyard Hill, to the head of the Gullet Glen, and many of the members ascended the Hollybush Hill and surveyed the castrametation there.

Progress was then made to Bronsil Castle. This ruined structure only presents the remains of one of the entrance towers, but the site, which is a tangled mass of bushes, evergreens, and weeds, is surrounded by a very wide moat, over which is a narrow bridge. The vicinity is pretty, and near the castle is a modern

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edifice, the residence of Mr. Hamilton Bailey, who was thanked for his courtesy in allowing an examination of the castle and grounds. The Rev. R. P. Hill exhibited a drawing of the castle as it appeared before its demolition, and Mr. Piper read an account of all that he could collect respecting its history. He said that it was built by Lord Beauchamp, of Powick, in the reign of Henry VI., but was demolished some time in the 17th century. There was an old story that in a vault here was a chest of treasure guarded by a raven, and whoever discovered it would be a fortunate man, but the bones of the last lord who owned the castle must be first found.

The carriages took up the party at Bronsil, and conveyed them at once to Ledbury, but a pause was made at the Court House, where Mr. Piper had kindly arranged all the articles that had been secured from the excavations on the Beacon Camp, and these, all carefully labelled, were inspected with much interest.

At five o'clock, the united Clubs partook of a plain dinner at the Feathers Hotel, Mr. G. H. Piper presiding. When dinner was concluded, the toast of "The Queen" was loyally responded to, and Dr. Bull was requested to give some account of the mistletoe.

Dr. BULL, in responding to the call, said he was sorry to find that the Mistletoe Oak in Eastnor Park was in a declining state, and the plant in less quantity than he had formerly seen it. He claimed Herefordshire as the headquarters of the mistletoe; it possessed several oaks with mistletoe upon them, held sacred in Druidical times, which were very scarce in Worcestershire and other counties. It had been said that male and female mistletoe plants never grow together on a tree, but he must contradict this, as he had seen them growing together.

Mr. E. LEES said that he had assisted Dr. Bull in hunting up Mistletoe Oaks in Herefordshire, and two had been discovered in Worcestershire. There was a physiological fact respecting the mistletoe, which it would be interesting to his Herefordshire friends to examine. Professor Buckman, in a work on "Orchard Trees," had stated that the mistletoe was of advantage in exciting the growth of apple trees, and causing them to produce fruit earlier than they otherwise would. An enterprising firm of nurserymen, Messrs. Smith, of Worcester, in accordance with this idea, had been advertising young apple trees for sale with the advantage of the parasite already growing upon them. Shakespeare had called the mistletoe a "baleful" plant, but it was for experience to decide this.

Dr. BULL, in reply, remarked that mistletoe might stimulate the growth of young apple trees, but if apples were produced earlier, they would be smaller and deficient in flavour. Orchards oppressed with mistletoe, when they became old, made a very wretched appearance.

Your President then expressed the thanks of the Woolhope Club for the kind reception their Malvern friends had given them. The excursion was a most enjoyable one, and many desired "happy returns of the day."

The second field meeting of the Club was held on the 22nd June, at Benthall Edge (Buildwas). Mr. Griffith Morris (Vice-President) kindly filled my place.

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The object of this meeting was to examine the drift-beds of the Severn, the Wenlock shale and limestone of the Silurian system, as also to visit the house and grounds of Benthall Hall, upon the kind invitation of Mr. George Maw, who met the Club at Buildwas, and led the way to the pits of sand and gravel close at hand. The spot was searched in vain for shells. The members then ascended the steep hill called Benthall Edge, where, on its summit, Mr. Maw gave a very interesting description of the main geological features of the district, assisted by maps and sections. Benthall Hall was then visited, and the beautiful gardens much admired, the plants therein being arranged in their proper classes, separated by rock-work.

The members were then invited to luncheon, where they met many of Mr. and Mrs. Maw's private friends. After luncheon the business of the Club was transacted.

The members were then taken through the rooms of this fine old mansion, where curiosities from all parts of the world are to be seen; the dried plants and geological specimens, as well as some drawings beautifully executed by Mr. Maw, were deservedly and greatly admired.

With many thanks for the most kind hospitality of Mr. and Mrs. Maw, the Club departed for Wenlock, under the guidance of the Rev. J. W. Ellis—a lovely walk, which would have been greatly enjoyed had not a thunder-storm come on which lasted all the way to Wenlock Abbey, where the remaining half-hour was spent in the interesting ruins. The members returned home by railway, having had a most enjoyable day's trip.

The third field meeting (ladies' day) took place at Tintern, on Tuesday, the 27th July last, when there was a large attendance of members and their friends.

The party travelled by the Great Western Railway from Barr's Court Station at 9.45, arriving by special train at Tintern at 11.30, and proceeded direct to the Abbey, where they were joined by Dr. Yeats (Chepstow), and Mr. J. Lorraine Baldwin (St. Anne's).

Dr. Yeats gave an oral explanation of some very curious stones found in the Abbey, and believed to be typical of the Trinity (three fishes), and the other supposed to be a plan of the Abbey estates.

An explanatory paper was read by Mr. Haddon (architect), giving a most interesting description of the Abbey itself, which Mr. Haddon illustrated by exhibiting some well-executed drawings and plans of the building. Owing to the difficulty of getting conveyances to convey the party to Trelleck, to view the entomological collection of the Rev. C. A. Kupar, which he had kindly consented to allow the members of the Club to inspect, the programme was in this instance departed from, and many of the members and visitors then wended their way to the woods of Wyndcliff and the interesting town of Chepstow. The day was beautifully fine, and the scenery from the heights of Wyndcliff was magnificent and thoroughly enjoyed.

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By the courtesy and great kindness of Mr. Lorraine and Lady Frances Baldwin some of the members and visitors were allowed to inspect their charming residence and gardens of St. Anne's, near to the Abbey. It contains such a collection of rare and interesting articles of vertu as is not easily to be found elsewhere, all arranged with most exquisite taste and judgment. The view of the Abbey ruins, and the woods in the rear, from the gardens, is most charming and beautiful; and, judging from the healthy-growing state of the many choice shrubs and flowers, the climate must be very mild and genial.

Sixty-eight of the members and their friends sat down to an excellent dinner at the Beaufort Arms Hotel, provided by Host Garrett. After dinner the usual toast of "The Queen" (the only one allowed by the rules of the Club,) was given by the President, and loyally received.

Dr. YEATS then gave an excellent address "On the river Wye as a source of interest to Naturalists," and also "On the Cistercians or Monks of Tintern as Naturalists, *i.e.*, as lovers of Nature and interpreters of Nature."

This address was exceedingly well received. It was full of matter, and most interesting to those who had the great privilege of listening to it. Dr. Yeats then exhibited a model of a boat constructed and fitted up for use as an ancient fish trap, supposed to have been constructed and used at Tintern by the Cistercian Monks. Dr. Yeats has kindly promised to put his valuable and learned remarks into the shape of a paper, to be enrolled amongst the Transactions of the Club. It will be of interest not only to those members who were allowed the great privilege of listening to Dr. Yeats, but also to many absent members.

At the conclusion of this address the President, on behalf the Club, thanked Dr. Yeats most warmly for the ready and valuable assistance he had rendered to the Club during their visit to Tintern. This brought the proceedings of the day to a close—the day up to that time had been exceptionally fine, and there was a very general expression of opinion that the visit had been most successful and enjoyable, and a wish was expressed by several ladies that they might be permitted to attend the next field meeting, this one having given them so much pleasure.

The Fourth Field Meeting took place on Tuesday, 24th August, at Church Stretton, at which I was not able to be present, and Mr. Evan Pateshall kindly consented to act for me.

The members left Barr's Court Station at 9.25 a.m., and reached their destination at 10.53 a.m.

The church dedicated to St. Lawrence was first visited—it is cruciform—has a central tower, also a nave, chancel, and transepts, Norman doorways north and south. In an angle of the tower is an image of the patron Saint. In the chancel there is a beautiful rich oak carving. There is also an elegant marble pulpit erected to the memory of the late rector. The walk then commenced up the Ashes Valley, by the side of the mountain stream, to the summit of Long Mynd, where in sight of the pole which marks the highest point, a plain luncheon of bread and cheese, beer, and cider was provided, and duly appreciated.

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The pole was then reached, and the business of the Club was there proceeded with—which being ended, the descent was made by the Light Spout (waterfall) and Carding Mill Valley to the Church Stretton Hotel, where the members partook of an excellent dinner.

Mr. JAMES DAVIES (in the absence of Mr. T. Curley), read a learned and exhaustive paper, written by Mr. Curley, on "The remains of extinct animals and British fossil oxen," discovered in engineering works carried out by Mr. Curley in Herefordshire. The paper was listened to with great attention, and a cordial vote of thanks was passed to Mr. Curley for such an interesting paper, also to Mr. Davies for reading it.

The members then returned home by rail, having spent a very pleasant day.

The Fifth and last Meeting of the year was held at Hereford, on Thursday, October 7th, after the Fungus Foray in Holme Lacy Park.

The usual formal business of the Club, including the appointment of the Rev. Augustin Ley as President for the ensuing year, and of the Vice-Presidents, Central and Editorial Committees, having been transacted, a large number of members, with some distinguished visitors, afterwards met at dinner, at the Green Dragon Hotel, to enjoy the usual dish of cooked edible fungi.

After dinner the toast of "The Queen" was given and very heartily received.

Dr. COOKE then read an amusing paper on "Mushroom Sauce," which was followed by a very exhaustive and interesting paper by Dr. BULL on "The New Potato Disease."

Mr. C. B. PLOWRIGHT also read a well-received paper on "The British Hypomyces."

In the evening a soirée was kindly given by Mr. CAM, to which all present at the meeting were invited.

This brings to a close my account of the year's proceedings of the Club. The year may well be described as an uneventful one, and as lacking in real work in the field. Yet I venture to hope that our meetings have been pleasant and interesting. I think I may say that they have certainly served the purpose of bringing our members together in considerable numbers, and of enabling us to exchange useful ideas and information. I have purposely omitted any reference to the pomological work now being so ably conducted under the auspices of Dr. Bull. The progress and execution of that work must be pre-eminently satisfactory to all the members of the Club. I shall best perform my duty, and consult your wishes, if I leave to Dr. Bull the privilege of giving you a report of the year's progress with that most interesting and valuable work.

I gladly take this opportunity of suggesting for your consideration the desirability of forming classes at which the inexperienced may attend, and under the guidance and instruction of our more experienced members may acquire a

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more intimate knowledge of the various subjects coming within the purview of this Club, and I hope may thereby be enabled to assist in keeping up its wide-spread fame in future years. It now only remains for me to thank you all for your kind forbearance during my year of office, and I will ask you to believe that I have fulfilled my duties, although very inefficiently, yet to the best of my ability.

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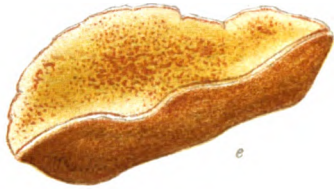
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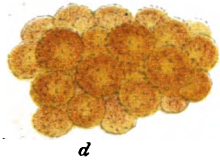
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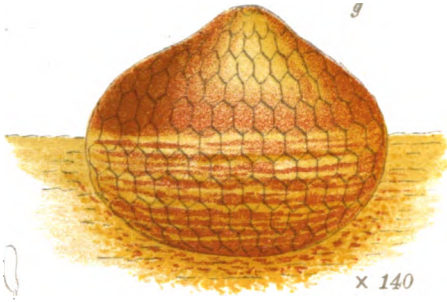
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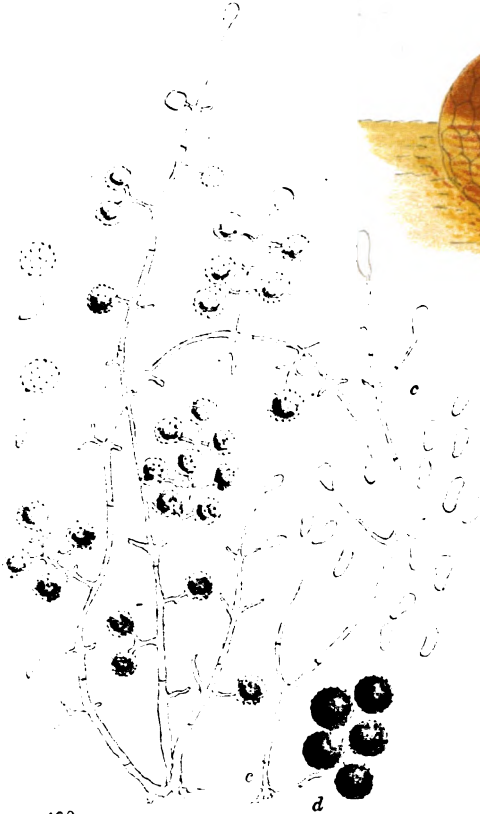
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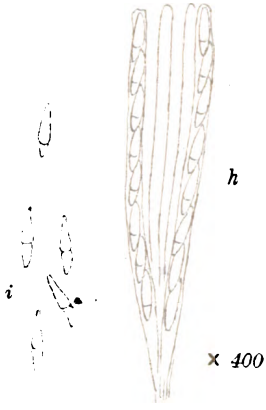
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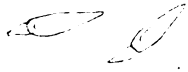
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M.C.C.

Hypomyces chrysospermus. Tul.

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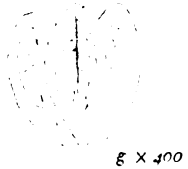

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Hypomyces asterophorus. Tul.

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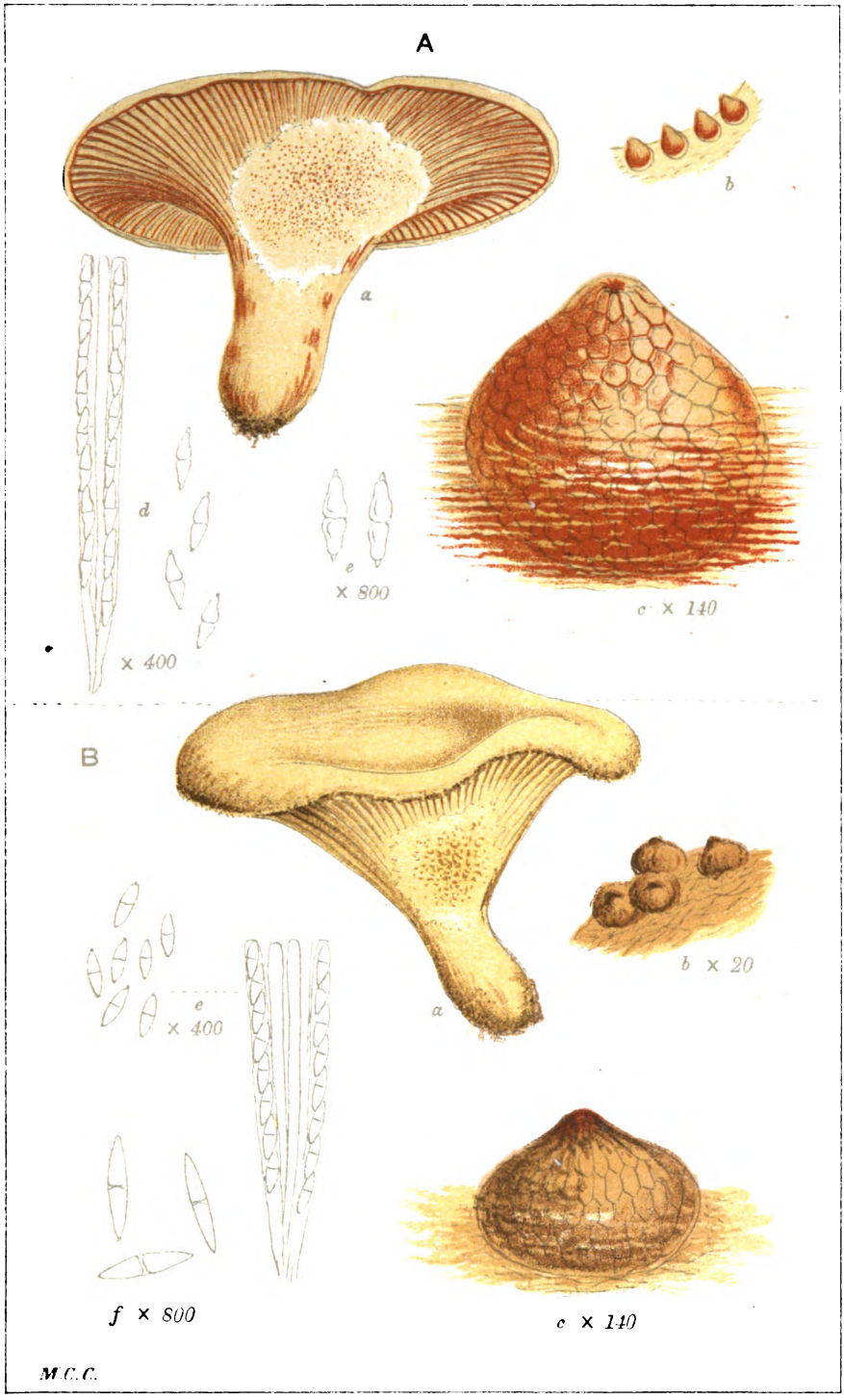

A *Hypomyces lateritius.* *Tul.*

B *Hypomyces torminosus.* *Tul.*

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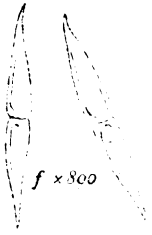

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Hypomyces rosellus. A & S.

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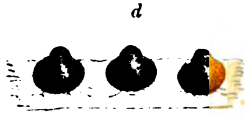

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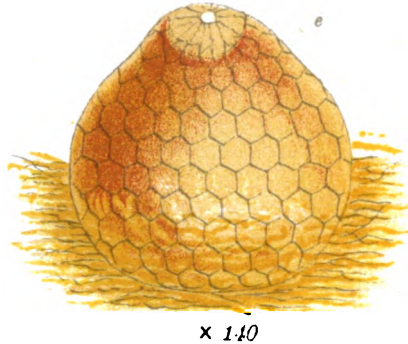

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M.C.C.

Hypomyces aurantius. Tul.

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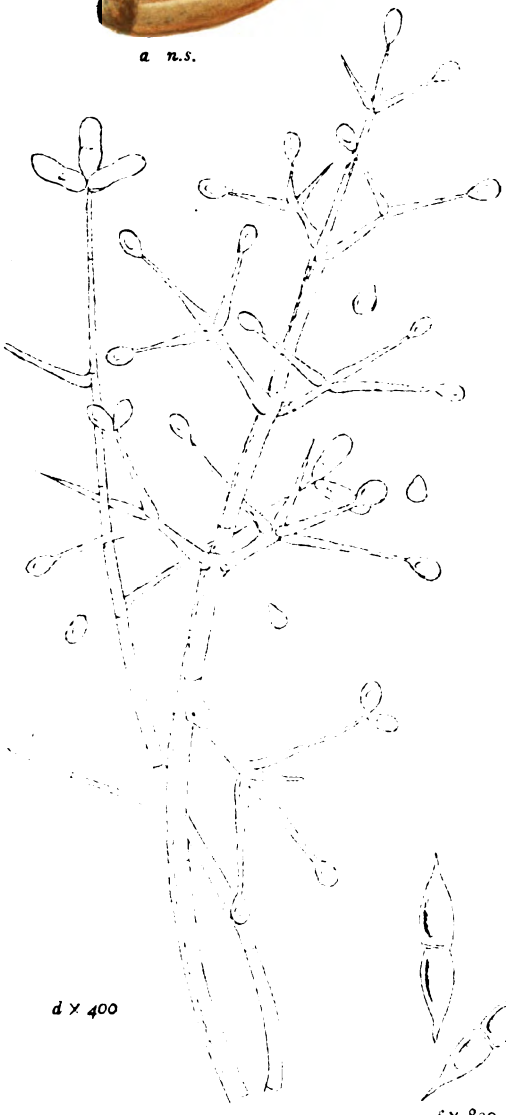

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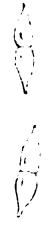

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M.C.C.

Hypomyces ochraceus. Tul.

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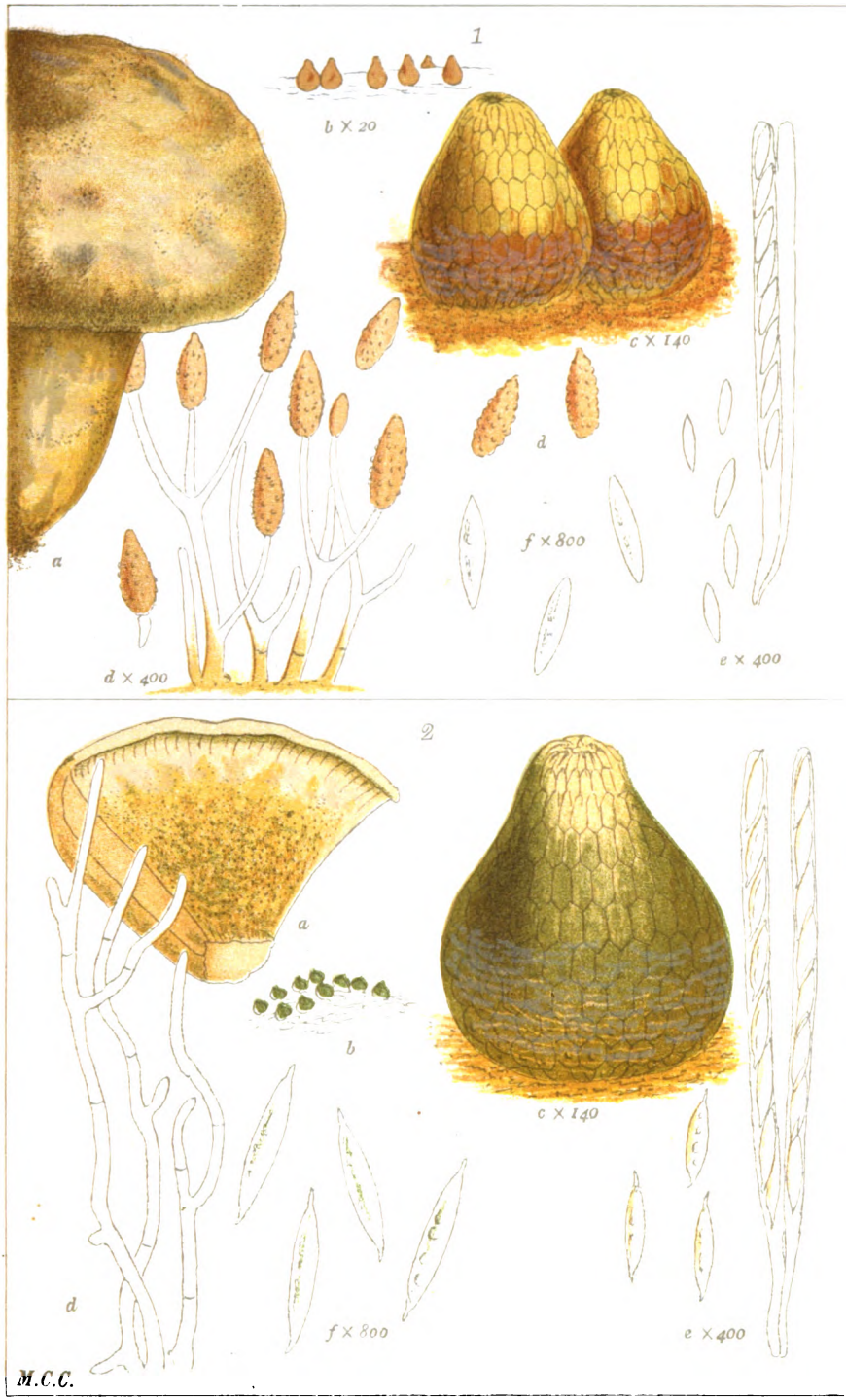

1. *Hypomyces Tulasneanus. Cke. & Pl.*
2. *Hypomyces luteo-virens. Fr.*

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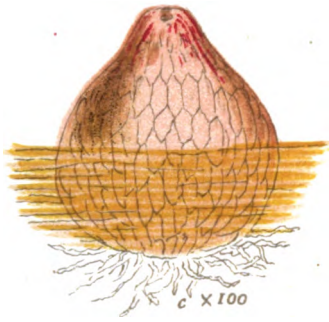
a

b



c × 100

d × 400

f × 800

e × 400

M.C.C.

Hyponayces terrestris. Plow. & Boud.

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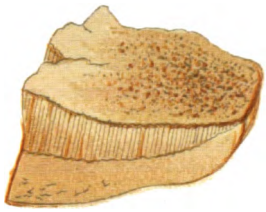
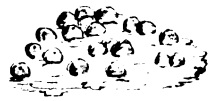
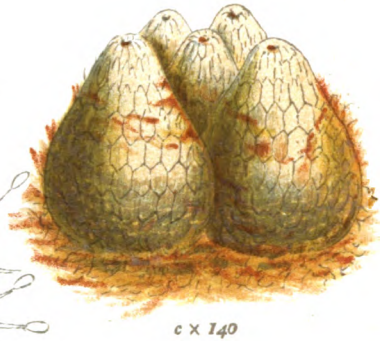


a

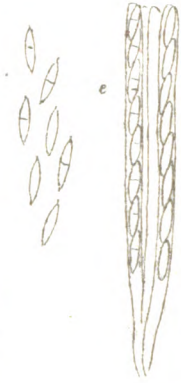


b

d



c × 140



e

e × 400

f × 800

M.C.C.

Hypomyces Broomeanus. Tul.

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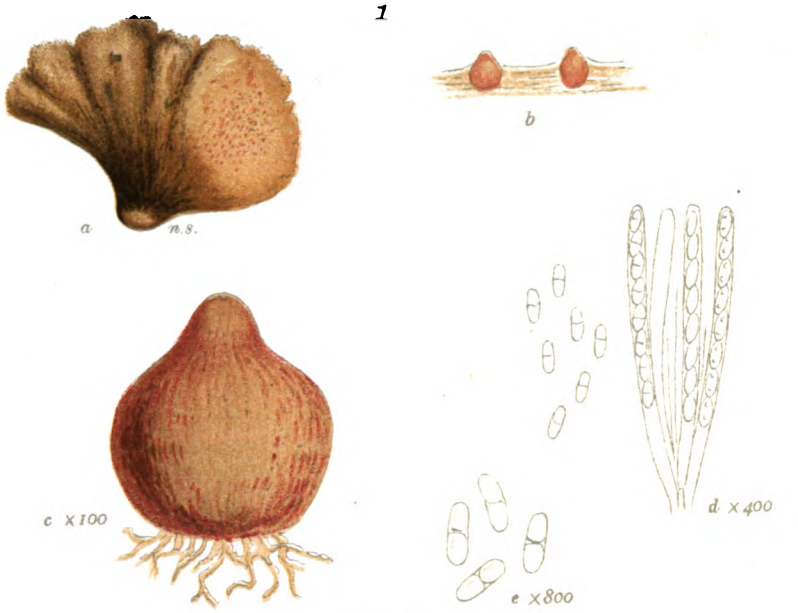
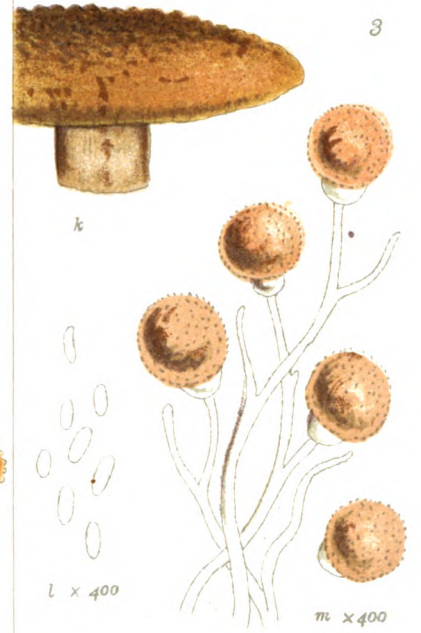


Hypomyces Berkeleyanus. C & P.

Hypomyces cervinus. Tul.



Hypomyces Linkii. Tul.

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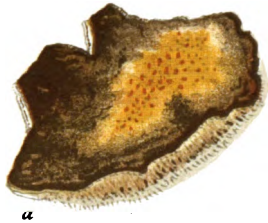
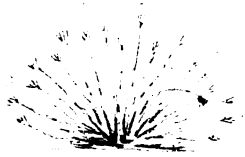
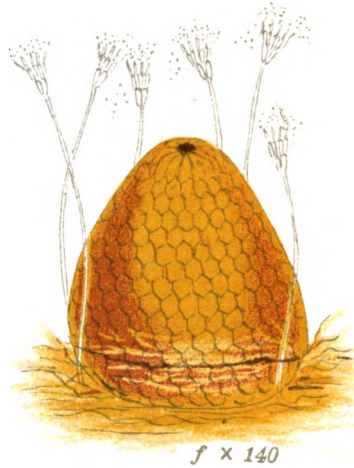


a

e × 15

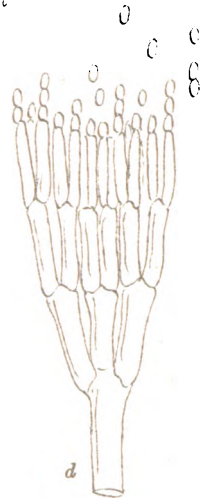


b × 40



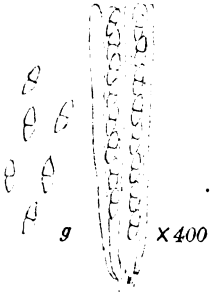
f × 140

c 400



d

× 800



g × 400

h × 800.

M.C.C.

Hypomyces aureo-nitens. Tul.

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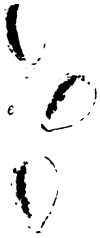
1

n.s. a

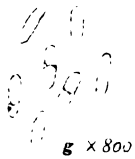
b

c × 100



e

f × 400



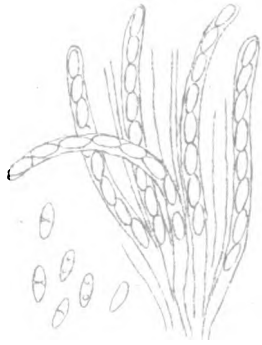
g × 800

Hypomyces violaceus. Tul.

2

h n.s.

m × 800



l × 400

k × 80

d × 400

M.C.C.

Hypomyces candidans. Plow.

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